

EXPLORATION TO - DAY

B.WEBSTER SMITH

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Special

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History + Geography

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OBSERVATION CHAIR IN USE, BRITISH GUIANA

By Permission of Major R. W. G. Hingston

Chapter III

Frontispiece

EXPLORATION TO-DAY

BY

B. WEBSTER SMITH

Author of "Some Great Adventurers", "The Navy Strikes", &c

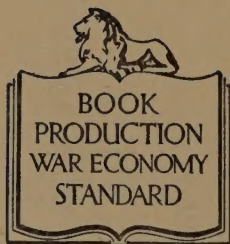
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EXPLORATION TO-DAY

CHAPTER I

Exploration To-day

It is sometimes remarked that the great days of exploration and discovery have passed away for ever, but this is not so. True, we shall never be thrilled by the encounters of a new Stanley with savages in the Dark Continent, or the sufferings of a second Captain Scott, or the triumphs of another Nansen. Most of the world's great empty spaces have now been penetrated. Deserts have few terrors for those who can attempt them in tractors, floe ice cannot stop the massive ice-breakers of to-day, the north and south polar wastes are open wide (on fine days only) to the adventurous aviator, whose cine-camera records for him more in half an hour than many a foot-slogging, sledge-pulling party has been able to learn in half a year. All this is perfectly true; and yet it is equally true that the real work of exploration and discovery is only just beginning. The Stanleys and Livingstones, the Cooks and Hedins, Amundsens and Nordenskiolds, the Martin Conways and Joseph Thomsons, have laid down the great lines which mark our maps; but the detailed study of the

world, except in a few highly civilized lands, has scarcely commenced; and it is a fact that there are many limited tracts still where no white foot has ever trodden. If explorers and scientists no longer spend several months in getting to their real starting-point, but travel thither in a train or an aeroplane, the work to be done is just as exciting, and sometimes just as dangerous, as ever. There are literally hundreds of peaks in, around, and behind the Himalaya which have never been either mapped, climbed, or even named. There are deserts in Africa and forests in South America, which are as little known. But apart from these, which are the proper object of pioneer journeys, much fascinating country exists where for many years people have passed, but which in numerous respects is almost unknown. Such an one is the vast Gobi Desert and its western extensions in the Altai and Tarim, where during the past fifteen years or so an immense amount of most curious information has been collected by explorers, not infrequently under the whistle of a bandit's bullet passing overhead. If, then, exploring to-day is a different sort of business from what it used to be, it still has the risks which to some young men are the spice of life, although (as one of the most famous modern explorers has remarked) such risks are now usually a sign of incompetence in planning and should be reduced to a minimum. Of course, if you are flying over the Pole and your engine cuts out, that is a misfortune; but it could be avoided by using a twin-engined aircraft!

This book aims to show how explorers during

recent years have taken advantage more and more of every scientific improvement which would help their work, by harnessing the aeroplane, the motor-car and tractor, wireless and echo-sounder, automatic camera and motor sledge; and yet how often they have found themselves still dependent in the end upon their own ingenuity and resourcefulness. It aims to show, too, that a mere love of adventure alone is not enough, but that the explorer must be either a specialist himself, or if he be an organizer and hunter, then his party must include specialists in order to make the journey worth while. If you, reader, have any ambitions in that direction, then your first step must be the painful one of mastering some particular branch of science, in order that you may not—as so many travellers did in the past—walk by the most obvious things which were awaiting discovery, and yet be unconscious of their existence. For the details with which I have sought to awaken your interest, I am indebted to many modern works of travel, and in particular to the following: *The Empty Quarter*, by Mr. Bertram Thomas; *Rub' al Khali*, by Mr. H. St. J. Philby; *The Desert Road to Turkestan*, by Mr. Owen Lattimore; *On the Trail of Ancient Man* and *This Business of Exploring*, by Mr. R. C. Andrews; *Riddles of the Gobi Desert*, by Dr. Sven Hedin; *Northern Lights*, by Mr. F. S. Chapman; *A Naturalist in the Guiana Forest*, by Major R. W. G. Hingston; *The Voyage of the Gjoa*, by Roald Amundsen; also numerous papers by these and other authors in the *Geographical Journal*, which still remains our national library of travel lore.

CHAPTER II

Blazing the Arctic Air Route
to America

There are some countries to which one cannot travel with any degree of ease or comfort, or even with any certainty of arriving at all, despite the use of every modern invention; and one of these lands, almost the nearest to Britain, is the east coast of Greenland. There, although scarcely north of the Arctic Circle, you find great cliffs of naked rock dropping into a fogbound sea, with beautiful and mysterious inlets winding away behind into the mountain fastnesses where hang the edges of the great ice-cap. Fog—thick, impenetrable fog—masks everything more than a few yards away along this coast; and out at sea huge icefloes roll and grind their way to the south, carrying with them fleets of bergs as a sort of outer defence to the strip of open water that commonly lies close inshore. Ships venturing into this strip of sea ice may, if lucky, get through in a few days; or they may be imprisoned there for weeks and then have to return to Iceland; or—as has so often happened to the stout-hearted Norwegians and Danes who hunt here for seals and whales—the ships may be nipped and wrecked, and their companies forced to struggle across the ice to the land water, perhaps only to perish at last of exposure and starvation. Aeroplanes setting out

from Reykjavik for the little Eskimo settlement at Angmagssalik are never certain of finding sufficient ice-free water upon which to land. Explorers who do get ashore find nothing but ice, rock, birds, seals and an occasional curious narwhal or a few of the huge, ugly, sleepy sharks that there abound; for there are but two Eskimo settlements upon the entire coast. Yet it is across this desolate, beautiful, fog-bound land that aircraft must pass if they wish to take advantage of the shortest or Great Circle route from Britain to the heart of Canada; and it was in order to learn more about it that a series of very interesting little expeditions took place during the fifteen years prior to the War.

A little more than twenty years ago senior students at Oxford and Cambridge Universities began to take a very active interest in exploration, partly from a healthy desire for adventure, partly from a real love of science, and perhaps also from a natural spirit of friendly rivalry. At first the Oxonians went to that rough training ground, the little-known islands near Spitsbergen; the Cambridge men, on the other hand, selected East Greenland. Later on, after Cambridge had finished with one part of this difficult coast, an Oxford party tackled another part of it while their opposite numbers were south in Graham Land.

The first three Cambridge expeditions to Greenland were led by Mr. J. M. Wordie, a veteran of Shackleton's adventures, and himself a geologist. A leading spirit in all three was Mr. Augustine Courtauld (of whom more anon), whose family, the

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artificial silk manufacturers, found much of the sinews of war. In the spirit of stout John Davis and Hudson, a little party of seven made the first voyage (1923) in the hired ship *Heimen*, a tiny cockleshell from Tromsoe. Their aim was to survey the fjords in the vicinity of Scoresby Sound, and to gain experience. The little ship, boldly forced through the ever-changing channels in the pack-ice, got to within thirty miles of Greenland, when heavy pressure ridges stopped her; then a gale set the pack in motion, the ship was lifted bodily up on to the ice, and although she eventually slipped back again, she narrowly escaped destruction. A second attempt to get through was just as unsuccessful. This was a bad year, when the ice-floes were more than usually dangerous. Even while the *Heimen's* small crew were extricating themselves, another ship, the *Teddy*, was crushed and sunk. Its crew, escaping across the ice, were lucky enough to reach land and so save themselves; but the crew of the Norwegian ship *Anni*, which also fell victim to ice pressure hereabouts, were less fortunate, none of them ever being heard of again.

Three years passed; then, in 1926, Mr. Wordie led a second party of eight Cambridge men to East Greenland. Men were flying across the Arctic now, but only broad exploratory crossings, and for the present the Light Blues stuck to the old technique. Their ship, the *Heimland*, gave them a little more elbow room than the last, but her burden was only sixty-four tons; and on this little sloop they had crowded, not only the scientific apparatus and tents for pendulum swinging, but also all the impedimenta

for a full-scale attack on one of Greenland's most conspicuous mountains. This year fog brooded over the pack, leads were plentiful, and through these waterways the little ship twisted and turned, until without much difficulty she emerged into the open sea off Greenland; but fog was around, fog lay ahead in impenetrable banks, and as they had no idea where they were they anchored. After three days the grey mist lifted, to disclose the rugged and beautiful rocky coast behind little Pendulum Island; near here was Hold-with-Hope, where Henry Hudson had similarly anchored more than three centuries before; and behind the islands lay the magnificent Franz Josef Fjord, up which they hoped to pass to the Inland Ice. For the moment, however, a fringe of shore ice barred the way, so a small party landed on Sabine Island, erected Whymper tents, and mounted therein the pendulums which Mr. Manley was to swing. This pendulum swinging, by the way, which has to be most carefully controlled, is an important aid in determining the earth's true figure; it is a type of work with which we shall meet again later. The rest of Wordie's young men remapped the coast, collected its rocks, and wore off the rough edges of their Arctic inexperience. Sabine Island is now quite barren, but the geologists found fossil tree trunks, buried in the ash from a very ancient volcanic eruption; all of which shows how very different this part of Greenland had been in the past. The ship then went off, surveying in the misty sea, and stopping repeatedly to enable the doctor to go ashore, where he searched for the stone rings and hearths of

ancient Eskimo habitations. When they tried to get back to Manley, a furious gale sprang up from the sea, pressing all the ice close against the land. The ship was nearly blown ashore, but the land party, on whom the full fury of the gale burst, took refuge in an abandoned hut where their predecessors had worked, and so escaped. At the beginning of August the weather changed. Winds from the land swept all the ice seawards again, and a way was cleared to Franz Josef Fjord, with its huge red and grey cliffs, capped with ice that constantly tumbled down into the still water, carrying masses of rock and dust as it fell. Once in the fjord, conditions changed completely. It was warm and bright. Up the side fjords were green valleys, with heathy plants, crowberries, blaeberrries, birds, and Arctic hares. At some places the water was so still that it reflected the ice-tipped cliffs like a mirror; at others bergs lay aground, some ready to topple over at any moment. At the head of the fjord was a great glacier, the Nordenskiöld; but its snout was seamed with deep chasms and almost impossible of ascent, nor could the ship safely be brought nearer than four miles away. A considerable distance up this glacier a very sharp peak, possibly the highest mountain in Greenland, had been seen by the Germans who discovered the fjord fifty-six years before; they named it Petermann Peak, and one object of Wordie's men was to climb it. A frontal attack being out of the question, several of them turned up a side fjord, called Kjerulf Fjord, where they got ashore and moved inland over springy turf, past flourishing

Arctic willows and birches, and within view of many a shaggy brown musk-ox. They ascended to the desolate wilderness of ice and rocks above; but time was against them, the ship being in constant danger of sinking should one of the many bergs overturn near her. Five days ashore was to be the limit; and when on the second day they found the mountain to be still a week's journey distant, they gave up the attempt.

Another three years passed; then in 1929 Wordie and his men returned to this area for the third time, again in the *Heimland*. On the way to Greenland they had several narrow escapes, the ship being nipped no fewer than four times between moving ice floes; nor could they get through at all without using ice chisels and blowing open a passage with dynamite. When at last they anchored off Hold-with-Hope, it was so late in the season (4th August) that little could be attempted, beyond geologizing on the huge cliffs of Franz Josef Fjord and sending a party in to Petermann Peak. The conquest of the peak itself proved easy, but they used up all their supplies and were much tried by a severe gale. The mountain proved to be just under 10,000 feet high. It was surrounded by many smaller summits, with other high ones tantalizingly remote; and beyond them the land ended in the glittering white line of the Ice Cap. The gales here were something to be dreaded. From the deck of the ship, nestling in seeming security deep in the fjord's heart, you saw a little greyish-black speck far up the glacier. It rapidly grew into an enormous onrushing mass of snow and

mist. The wind began to howl, the willows to crack, and the ship to rock; and then in an instant the full blast of the gale was upon you and you were holding on to the rails for dear life, while the sea, beaten into great waves, smashed furiously upon the bergs, and spindrift cut through you like a knife. Such storms might last three, four or even seven days or more, before they blew themselves out and allowed the white-crested, foamy water to subside into its previous calm; and during all that time you would have to shout to make yourself heard above the noise of the wind.

By this date aviation had become sufficiently secure for people to talk seriously about aerial journeys across the Atlantic. Now the shortest route to Canada from this country is a Great Circle route, that is, along a line between, say, London and Winnipeg, which runs round the globe as if those two places were on an arc of a circle; the direct line joining the two cities is much longer. The Great Circle route to Winnipeg would take in Reykjavik, the southern part of Greenland, Hudson Bay, and it would first be necessary for somebody not only to blaze the trail, but to obtain a thorough knowledge of the air conditions, possible landing places, and other essential information to be gathered. In order to do some of this exploratory work, Augustine Courtauld and several of his friends organized a large expedition to Angmagssalik, starting in 1930; it had official support from the British Admiralty, War Office, and Air Ministry, and was called the British Arctic Air Route Expedition.

Its leader, H. G. Watkins, although only twenty-three years old, had already distinguished himself twice in the Arctic and showed the very highest promise. Apart from Courtauld and one or two others, the rest of the party had no previous experience; but they were a tough bunch of young men, and several of them have had distinguished careers since: Mr. L. R. Wager, for instance, who geologized on the face of Mount Everest, and Mr. J. R. Rymill, who so successfully led the British Graham Land Expedition five years later. The most important feature of the proposed venture being to ascertain air conditions, it was decided to establish an observatory in the heart of the Ice Cap and maintain it there for a year, a sufficiently ambitious programme even for Cambridge men! The coast, the mountains, possible harbours and landing places, also called for close survey. Two De Havilland Gipsy Moth aeroplanes were taken out, packed in crates. On arrival, they were to be assembled by Flying Officer W. E. Hampton, and piloted by Flight Lieutenant N. H. D'Aeth of the R.A.F. Mr. H. I. Cozens, the photographer, was also a flight lieutenant. For transmitting news and picking up time signals, wireless masts, with transmitting and receiving sets, were provided, being under the care of Captain P. Lemon, of the Royal Corps of Signals. The old *Heimen* could not carry such a large party, but the ship selected, the famous old *Quest* (on which you may remember Shackleton died a decade earlier), was not much better. She was dangerously overloaded; and she bucked and rolled so much on the

voyage to Greenland, sometimes achieving angles of forty degrees, that nearly everyone on board was heartily glad when, after an easy passage through the ice, they were piloted by Eskimos into the calm water among the islands outside Angmagssalik. Thirty miles beyond this settlement, they found a fjord from the head of which it seemed possible to climb up to the Ice Cap. They named it the Base Fjord; and here, on the stony shore, everyone was soon working like a slave, unloading the bulky stores, erecting a wooden hut, building bunks along the walls, fitting together storehouses, workshops and a kitchen. While some men erected the two seventy-foot wireless masts—no easy job in that hard, intractable ground—Hampton and D'Aeth assembled the first seaplane, which was soon in the air and making its first reconnaissance. Then Watkins, Scott, and F. S. Chapman pioneered a route up the glacier for a considerable distance, despite great difficulties, and marked the way by flags; another party was then detailed to carry on this work, penetrate to the heart of frozen Greenland, and there establish the observatory. Meanwhile Watkins and most of the others went back to the *Quest*. The Danish authorities had long been anxious to find for their East Coast Eskimos a new hunting ground farther north; and such an one had in fact been discovered, where there was an abundance of good fishing, with many seals and polar bears. The *Quest* now set out for the north, carrying, besides her own people, a crowd of Eskimos, Danes, women, children and dogs. The intention was to reach Kangerdlug-

suak Fjord, about a hundred miles away, and there to start mapping the little-known stretch of coast back to Angmagssalik. In and out of the fjords she went, following the band of open water, making good progress across the calm sea in the fjords themselves, but sadly misbehaving in the open sea. Her master, Captain Schjelderup, had a curious habit. He was a burly man, who commonly went about bareheaded, but in moments of great danger he always donned a hard bowler hat. He wore this hat almost continuously on this trip. Once, enveloped in mist and gale, and surrounded by bergs and dangerous drifting ice-floes, they rolled so much that he ran the *Quest* into a fjord for safety; when they awoke next morning it was to find glacier ice level with the crow's nest! On another occasion, when it was pouring with rain, the ship ran aground, but happily at high tide she was got off again undamaged. Then they got back into the open sea, where the great floes were tossing about like pancakes, rolling and grinding together impressively in the swell. On 20th August they crept at last into the quiet expanse of Kangerdlugsuak Fjord, a large and most beautiful sheet of water, in the surface of which mountains and bergs showed up as in a mirror. Here others found cause for anxiety besides the captain. The plane was floated off, and went up with D'Aeth and Watkins on board; they cruised about for an hour, and then, on trying to regain the ship, found that the ice had closed up, and only after a long search could sufficient ice-free water be found for the plane to come down again. While the ship went on, Messrs. Stephen-

son, Courtauld and Chapman were disembarked, with a tent, stores, and a motor-boat, their aim being to make their way back to Angmagssalik along the coast, mapping *en route*. Life abounded in the fjord. There were many seals and narwhals; Arctic hares and Arctic foxes were seen on shore, while fine fat salmon were to be caught almost for the asking. Some of the other life was not so pleasant. Once the boat party spotted a polar bear; he was poised on the edge of an ice-floe, and they only shot him just as he was about to spring into the boat. The huge body tumbled into the sea with a crash, and the wash nearly swamped them. Then they got into trouble through sheer inexperience. They had landed, erected the tent, and left the boat securely fastened to some rocks, without realizing that it was high tide. When they awoke, they found to their horror that during the night the water had fallen, the boat had tilted up, and everything in it—petrol, ration boxes, oars, and (most important of all) an instrument box containing their precious theodolite, sextant and cameras had gone to the bottom of the sea. Tortured with anxiety as to what their leader would say, they searched and dived all day, for some of the contents of the boat had floated away; and it was evening again before they found the instrument box, lying in fifteen feet of icy water. Their next adventure was even more serious. There were many shoals, it being difficult to detect them, and of course they succeeded in running head-on upon a submerged rock. Then, with full speed astern, they got her off, only to run immediately stern foremost upon a



THE MOTH ON THE BASE FJORD IN WINTER: GREENLAND

By Permission of Lieut. A. Courtauld

second rock, smashing the propeller shaft casing, and thereby putting the motor out of action. But the *Quest* soon returned to their rescue. The sea outside had been so rough that it was deemed unsafe to venture a small boat in it. The rest of the survey had to be done by stopping the ship, sending Stephenson ashore at 3 a.m. and picking him up again at night, not before the captain, who was naturally anxious upon such a coast, had sounded more than one warning blast on the *Quest's* siren.

The Ice Cap party had also had severe difficulties to surmount. Mr. Scott, who had been in Labrador with Watkins and was a capable dog driver, took charge, while Mr. Rymill plotted the route. Messrs. Bingham, Riley and Lindsay, the two last of whom were to remain on the Ice Cap as the observers, completed the team. They had four sledges, each with seven dogs, and in all more than one ton of supplies. The ascent of the glacier proved none too easy, and before they could even reach Bugbear Bank, where the first reconnaissance had come to a halt, there was much straining of backs and shouting at dogs, and slipping and slithering about on the awful slopes. It poured with rain, which of course made things worse. Each sledge had to be taken up singly by the entire party, but they did it, sometimes in ankle-deep slush. Abysmal crevasses were hidden by a treacherous coat of soft snow; over these the two leaders found a way, not always realizing their position until they were actually upon the fragile bridge. Although roped together, both fell through; and once a whole dog team fell into a

Exploration To-day

crevasse, but the harness held, and they were hauled back again; but it was not a happy experience to feel nothing beneath one's feet. Bit by bit they got up to the plateau, although they covered only fifteen miles in six days; then, marking their route by red flags at every half-mile, they marched on and up, the mountains receding behind them, until at last they were 8600 feet above the sea, and in the middle of the wilderness. The Greenland Ice Cap is an enormous body of ice, several thousand feet thick, which covers the entire country except for the mountain rim and the coastal valleys; countless layers of snow, the product of many a fierce gale and storm, form its uppermost part, but although soft and fine as dust, men on skis and sledges with broad runners can traverse it. At the spot to which the Cambridge party had penetrated, which was 127 miles inland, they were nearly midway between the east and west coasts, all land (i.e. mountain peaks or nunataks that rose above the ice) being far behind, and out of sight.

Here it was decided to set up the meteorological station. A strong double tent was erected, with the entrance from below, by means of a tunnel through the snow. Riley and Lindsay were then left to complete the station, while the other three hurried back to the base. The two observers now built a wall of snow round the tent, fixed a ventilator, and got the instruments working, some of them necessarily in the open, others behind improvised shelter. Boxes of stores lay all over the place, in constant danger of being buried and lost through the snow, which every

breeze drifted along like a fine mist, only a few inches above the ice; so two storehouses were cut out of the snow-floor, one on each side of the tent, and connected with it by tunnels. For warmth they had Primus stoves and an Aladdin lamp, with twenty-four gallons of paraffin; but they never got the temperature inside to more than forty-five degrees, and sometimes they had thirty or forty degrees of frost. Touching instruments with bare fingers in this temperature was no joke. The two men had full sledging rations for five weeks, but the Arctic ration is very heavy, and here at the station, where they were relatively inactive, it could safely be reduced to half as much. Their retreat was secured by a spare sledge, a small tent, and a reserve supply of food; nevertheless it was very lonely up there; and when one stood at the instruments, with the wind howling or moaning over the plateau, and snow drifting like mist above one's head, one could not help thinking sometimes that one was the last man left on earth. However, a return to the tent (first carefully brushing off all loose snow), and a warm mug of hot food, would soon induce other thoughts. On 2nd October, after almost five weeks alone, a relief party arrived.

Other autumn trips ashore were also made from the base, but the autumn gales there were sufficiently bad to damp the ardour of the greatest enthusiast. They would come roaring down the fjord from the plateau, making a tremendous fuss, lashing the sea into spray, and rattling the huts as if to blow them away at any instant. One such gale registered

129 miles per hour on the anemometer, after which the top of the instrument blew off; the wind then continued to increased in violence until it brought down one of the seventy-foot wireless masts. Ropes were slung right over the dwelling hut and securely moored, but even then the building threatened to carry away. Both aerals once came down in a single day; and even in the bitterly cold month of December the gales swept all ice out of the fjord and by their fury prevented the sea from freezing. As spring approached the storms became worse, and at last (as if laughing at man's efforts in such a place) succeeded in breaking loose the Gipsy Moth and smashing it to pieces; fortunately the engine remained intact, and Hampton and Rymill, who had abundant spare parts, spent the next few weeks in rebuilding this machine.

Meanwhile a singular little drama was being enacted far away in the middle of the Ice Cap. The second occupants of the station, Messrs. Bingham and D'Aeth, remained there two months, or until 3rd December, when they were relieved by a party which for five weeks had been endeavouring to reach them. The relief was rather short-handed, and Augustine Courtauld, who was among them, volunteered to stay on alone. He had had plenty of Arctic experience, and in any event another relief was planned to reach him in three months; but three months alone in the heart of Greenland is not a prospect to which anyone looks forward with much pleasure. When his comrades returned to the base, they left him with full rations for eighty-four

days, or sufficient for an inactive man to live comfortably for double that time; also twenty-six gallons of paraffin, every drop of which was essential, and calculated to last him for thirteen weeks.

It had been intended to start on the relief journey early in February, but the fierce gales made all movement impossible, nor could seals be caught with which to feed the dogs. The aid of the dogs being essential, fishing for sharks with rotten blubber through holes in the ice was resorted to, and this produced a number of those ugly fish, usually eight or nine feet long. At last, 1st March, Scott and Riley were enabled to get away for the Ice Cap. It was snowing and drifting steadily, with visibility never above a few yards; and after plunging into one deep snow-filled hole after another, straining and tearing the sledges on the sharp ice, and thrusting, hauling and guiding them so as to help the dogs, for four heart-breaking days, they failed to get up the glacier and had to return. On 9th March they tried again; but now it had suddenly become warm—thirty-nine degrees—and there was thawed snow and slush everywhere. The loads were cut down to a minimum, but even the absolute necessity of getting up to the station counted for little on such a surface. It was misty, the flags marking the route had been buried, and they marched by compass. After eighteen days of this they reached the vicinity of the station, but to their growing alarm could not find any trace of it; all the marking flags there had vanished too. They erected their tent, and started a systematic search; being hindered not a little by

the swirling drift and gales, which confined them within the canvas for days on end; and as fuel had to be hoarded like gold, they sat and shivered under their frail covering in forty degrees of frost. Once the temperature went down to minus forty-six degrees Fahrenheit, or seventy-eight degrees of frost. Time and again they dug out their tent and the sledges, when, just as they were ready to start, up would come another storm and bury them once more; and behind all this, too, was their natural anxiety for the fate of Courtauld. They worked out their position repeatedly, but despite a search lasting three weeks could find no trace of him—tent, sledges, instruments, all had vanished, swallowed up by the ice. At last Scott decided to return to the base for help, before his dogs became too weak; and on 18th April, after travelling twenty miles per day, the two explorers reached the hut.

Watkins was now in a most unpleasant situation. He decided at once to send a wireless message home to Courtauld's family that the observer had plenty of provisions and that another party would go out at once in search of him. This party comprised Watkins himself, Rymill and Chapman; but at first they were just as unfortunate as the others, not being able to start because of a three days' gale. Then they forced their way up the glacier, the weather began to improve, and on 3rd May, in brilliant sunshine, they approached the station. You might think that a dark object like the tent would be clearly distinguishable miles away; the snow, however, was drifted up so much by the gales

that it cast shadows everywhere, and to find a tiny thing like the top of the tent in such a place was worse than looking for the needle in the proverbial haystack. Rymill quartered the ground, covering small areas systematically for some twenty miles, but even this produced nothing. Their portable wireless set gave them a time signal on 5th May, which enabled them to calculate that they must be within a few hundred yards of the station. They then spotted a flag at last, and raced to the station, which was a mile away. It looked very grim and lonely. Its mast and flag had blown away, and only the tops of some instruments and the handle of a spade protruded above the snow. Then Watkins noticed the tip of the ventilator. He knelt beside it and shouted down. There was a faint answering cry from below. They kicked and shovelled two feet of snow off the top of the tent, cut a hole in it, and went in through the roof. Courtauld was below, in his sleeping bag, quite well, but bearded, unkempt and grimy. The weight of snow had forced the double tent inwards to little more than half its original floor space; icicles hung from the wall, the last of the fuel had gone, and only cold food remained. The records were collected, Courtauld was helped up to the surface, where he soon recovered his strength, and the station was abandoned. While they were quietly marching back next day they heard the unexpected roar of an aero engine, and a few minutes later a Junkers monoplane circled above them. It was piloted by a plucky Swede, Captain Ahrenberg, who had answered the call of the Courtauld family

and despite great difficulties—for one thing, his machine could only rise a short distance above the plateau—had already been searching in this region for several days. He now dropped a parcel of food and then turned to take the good news back to the base. There the relief party joined him a few days later.

What did Courtauld do with himself all those Crusoe-like months on the Ice Cap? This was the question which most Englishmen were asking at that time, and which continues to be asked whenever the adventure is mentioned. At first, according to his own modest but thrilling account, he found plenty to do.

He had to make his quarters as snug and dry as possible, install the stoves, unpack supplies, and get the wet, powdery snow out of his clothes and sleeping bag. Six times a day, whatever the conditions, he had to go out and read the instruments, besides making notes of the weather generally; and this involved dressing in his furs, which on his return had to be carefully shaken free from snow, otherwise they would have frozen stiff; but despite every precaution garments crackled and had to be bent to shape, before they could be got on. Once the temperature dropped to minus sixty-four degrees, or ninety-six degrees of frost—sufficiently cold for the hardest Spartan! But on the whole, when his pipe was alight and the broth filling the tent with its aroma, he seems to have thought life good enough. On some days, indeed, it was bright, still and clear, and at night the aurora shot its magnificent streamers



THE ICE CAP STATION. DOME TENTS AND TENTS OF RELIEF
PARTY. AUTUMN 1930

By Permission of Lieut. A. Courtauld



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THE ICE CAP STATION AS FOUND MAY, 1931

By Permission of Lieut. A. Courtauld

of colour across the blue vault overhead; but there were others, when blinding swirls of snow encircled him as he poked his head out of the hole, and mad gusts of wind tried to hurl him down while he stumbled across to the instruments.

He soon had more than enough work to keep him busy, for the snow persisted in drifting up the mouth of his tunnel, and his life, in fact, soon resolved itself into a long, losing struggle to keep this tunnel open. He was compelled to shovel the snow away behind him, thus his efforts only made the free space smaller. The passage became so small that he could scarcely crawl through between the snow and the roof; finally, at the end of the year, a gale completely closed it. He then cut a way out through the roof of one of the snow houses. Another passing anxiety was a shortage of supplies. He had neglected to collect his food and petrol within the snow houses; and when he went outside for the reserve supply it had vanished. It took him several weeks of patient searching before he found the goods, buried beneath six feet of drift. At about Christmas came a further shock, when he noticed that four gallons of his precious petrol had leaked away; this necessitated cutting out the use of one stove altogether and relying upon the Aladdin lamp for warmth. When mid-March came, and there was no relief, he was not particularly alarmed, feeling certain that his comrades would rescue him; but his difficulties now increased. The roof of the tent sagged ominously, suggesting that at any moment it might collapse on top of him. One storehouse developed a crack,

through which drift snow speedily penetrated until it filled it. Icicles hung in bunches from the tent top, and whenever the fabric sagged a shower of icicles fell on the unfortunate observer. Finally both snow houses became unusable, and after the 22nd March he could no longer get out, although he kept a line of retreat open by scratching at the roof with a pen-knife. All this would have been sufficiently bad, had not his light supply failed. He then tried immersing a string in a tin of ski wax, and with great care obtained a flame that flickered ominously for a few minutes before it burnt itself out. His tobacco failed. He was reduced to feebly warming a little oatmeal each morning, and living for the rest of the day on raw pemmican, biscuit and margarine. The last of his oil went on the 5th May. A few minutes later he heard Watkins overhead.

Courtauld's remarkable experiences somewhat overshadowed the very real merits of this expedition, which, besides a seven months' continuous meteorological record on the Ice Cap (a thing never attempted before), produced a crop of journeys each of which was notable in itself. Only a few days after Courtauld's relief, three of the party—Messrs. Stephenson, Wager and Bingham—set out on a round trip of 350 miles to climb Mt. Forel, a high peak in the coastal mountains. It proved to be the highest mountain yet measured in Greenland, and although they ascended to 10,950 feet they failed to reach its summit.

Not content with this exploit, Stephenson joined forces with Messrs. Scott and Lindsay when, at the

beginning of July, they set out to cross Nansen's track to the west coast, a journey which took them up to 9200 feet on the slowly rising Ice Cap before they began to descend the western slope. Like Nansen more than forty years before, they found the going easy enough once they were upon the Ice Cap; it was getting up there past the terrible maze of crevasses and seracs, and getting down again, which provided the thrills. Like Nansen, too, they picked up a following wind on approaching the western side, and by hoisting sails on the sledges, were swept forward at a rare rate. This party covered 433 miles in twenty-eight days, which is good going. They came out near the south-western corner of Greenland, not far from the little station of Julianshaab.

In order to catch seals, many members of the expedition spent the early part of this summer in learning to manage the Eskimo kayaks, light canoes covered with skin, in which, when one is firmly squeezed, a skilful occupant can safely brave a storm. It is a dangerous craft, however, and when overturned may leave the kayaker suspended head downwards in the sea until he drowns. Watkins himself lost his life through such an accident two years afterwards.

Having collected a great deal of most useful data, part of the expedition went south by motor boat, mapping the coast; while Rymill and Hampton carried out a second and even longer crossing of the Ice Cap. That they all escaped so many hazards speaks volumes, not only for the organization, but also for the physique of the men.

CHAPTER III

In the Tree Tops of British
Guiana

It is a far cry from the glaciers of Greenland to the steaming forests of Guiana, where a party from Oxford University was working at the same time as Commander Wordie and his men were planting their axes on Petermann Peak.

The Oxford University Exploration Club had that year organized an exceedingly interesting piece of pioneer work, nothing less than the study of the vertical distribution of life in a tropical primeval forest. Thousands of people have struggled along the narrow paths in such forests, buried under a maze of leaves and branches, caught up by snaky creepers, or tripping over roots, or chilled by the silence, loneliness and gloom. Back in the great age of exploration, the heroic Stanley had hewn a way through hundreds of miles of dense forest, fever-stricken, the home of savages who were quite good shots with poisoned darts and of a whole host of poisonous snakes and other unpleasant things. Alfred Russel Wallace, the gentle Bates, the determined André, and many others, had penetrated into and collected from the vast forests of the Amazon and Orinoco. But up to 1929 nobody had ever done anything above ground level. The trees rose in great straight stems, hard as iron, and branchless, for seventy or eighty feet,

there to crowd and push each other aside, to interlace their branches, and to form a canopy where monkeys, snakes, fierce spiders, magnificent blue *Morphos* butterflies, and many other living things had their homes. Unless a tree was felled none of these things came into the naturalist's hands, except by accident. The Oxford plan was to get up into this canopy and to study and collect from it. The object being novel, and in one sense important (for very little was known about the valuable hardwood forests), the Government officials in the Colony were helpful, and the expedition, which arrived at Georgetown on 5th August, 1929, was soon far up the huge Essequibo River and beginning its work. It comprised eleven members, the leader being Major R. W. G. Hingston. Two were botanists, two studied and collected insects, two devoted themselves to the birds, one was a zoologist, one a taxidermist, one made surveys, and one operated the wireless. Mr. T. A. W. Davis, of the Colony's Forestry Department, joined them and gave invaluable help. They also had a number of Indians, as boatmen, cooks, and particularly to fell trees, make the camp, collect and skin animals, while one Indian hunter kept them supplied with fresh meat throughout the three months which they spent in the wilds.

The Essequibo, which the writer of these lines knows well, is a huge, sprawling brown stream, the walls of which are lined by magnificent forest. Our naturalists, however, desired to work in a region which was quite untouched, so they turned aside into a hidden tributary, the Moraballi Creek, and

from the blazing sunshine of the open river immediately found themselves in a dark, silent tunnel, with huge trees interlacing overhead, others tumbling right down to the coffee-coloured water, others sticking up as snags from the bottom. On either side were swamps, commonly with masses of beautiful palms. Birds, insects, and animals generally seemed—but only seemed—to have vanished. Two miles inland, a patch of high sandy ground rose above the surrounding swamps; it was as crowded with trees as the rest, and as this spot had been selected for their camp, they at once set to work to clear it. Axe and saw, hammer and word of command, the crash of some falling giant, and the harsh screams of disturbed monkeys as they sprang away, resounded on the little spot through which the blinding sunshine poured. One huge tree was left standing in the middle, and round it a clearing of more than fifty yards in diameter was made; this involved the felling and subsequent removal of more than one hundred trees, each of which of course provided the collectors of plants, insects, lizards, and snakes with readily accessible specimens. Great lengths of bush rope were also cut down. Then, using only the local product, posts were erected, having forked summits; across these horizontal beams were laid, and over the beams tarpaulins were pulled into place, so as to provide shelters open on all sides to the air. You may think this sort of home somewhat primitive, but really it was ideal, for at night it was practically as warm as in the daytime, and down there, surrounded by an impenetrable forest wall, no wind ever dis-

turbed even papers which were left lying on tables in the open. Every day it rained, sometimes in torrents; and far above, in the canopy of green branches, lightning played and storm-winds howled, but these disturbances never reached to the soft, brown, leaf-covered forest floor. Each man had a hammock and a mosquito net; and besides their sleeping quarters, there were shelters where the cooks, the taxidermists, and the naturalists might carry out their tasks. Thanks to the possession of two motor boats, letters and valuable specimens could speedily be carried out to railhead on the Essequibo and so to Georgetown; this was particularly useful because, in that humid climate, green mould speedily attacked everything, especially leather, skins, and photographic films.

What sort of a place was this forest, dark, gloomy, silent, smelling strongly of mould, and frightening like a prison in its loneliness? You step ashore, force a way between saplings that line the bank, and in a few yards are so utterly alone that you might be hundreds of miles from your friends. All around you rise trunks of trees, almost vertical, with never a branch till they reach the canopy seventy feet or more above your head; trees with smooth bark, trees that are rough, hollow trees, eaten out by termites and crumbling beneath the weight of one's hand, giant trees with plate-like buttresses as high as one's head, or more. Shafts of light stream down as through the windows of a cathedral, but it is inexpressibly melancholy and still. From above hang strings and ropes of lianas, the tumbling roots of

orchids, climbers of many kinds, some wound round the stout trunks of powerful trees, others hanging like slack rigging on a ship. There are no bushes, no undergrowth, and practically no spiny plants. You cannot move a yard without brushing against some young sapling, straight as a walking stick, which aspires to force its way through the canopy far above, and then to expand like a few of its more fortunate relatives. The musty smell of decaying vegetation is everywhere; everything but the trees and their attendant growths seems dead. This, however, is a pure illusion. Keen eyes are watching you on every side, the eyes of creatures whose habit it is to meet danger by themselves becoming still—moths which appear to be dead until you have almost touched them, when they fly away, lizards, and even birds which employ the same device. Only up in the canopy does life seem plentiful. There you can hear, and sometimes see, the red-faced howling monkeys, and with a glass can pick out the chattering green parrots or possibly a gorgeous splash of red on some indifferent macaw. Up there, brilliantly coloured butterflies sail, sometimes in dense swarms; down here, all the colours are brown, green and black, like the surroundings. How can one get up there, the better to see these things? That was the problem which Major Hingston and his men had to face; and this is how they solved it.

They had been warned that tropical tree trunks could not be climbed directly, because of the hosts of poisonous biting ants which infested them; and they had therefore brought powerful sprays, with

which to clear the surface. In fact, however, the ants were not so serious a foe after all, and it was by true tree climbing that most of the results were obtained. They had brought rocket guns, from which lines were shot over branches from the clearing, but it commonly resulted that the line fouled somewhere aloft and would not come down. They also had sixty-foot lengths of rope ladder. These were excellent when securely fastened in the canopy and guyed to prevent them from swinging round as one ascended. Then there were short wooden ladders, and stout iron spikes for driving into the trees; but the latter proved a complete failure, springing out of the hard wood again after they had been driven in only an inch or so. The best method, and the one on which they soon came to rely, was to send up a couple of experienced Indians who normally climbed and bled trees for balata. Armed only with a bush rope, these men would go up the straightest trunk to where it branched eighty feet above, and there, clearing a space in the canopy, would firmly fix a block and tackle. From this point ropes were passed down, rope ladders fixed in contact with the ground, and a cradle hoisted (again with guide ropes to prevent it from swinging) to the dense foliage above. Within the branch the observer, after his somewhat hair-raising ascent, would build a small platform, and there he could sit at ease for hours on end, noting and recording everything he saw. Or he could use the wooden ladders to climb along the branches, or could search the upper regions with nets provided with very long handles. In this

way, during their three months' stay, the Oxford naturalists made very large collections.

It was soon found that many creatures were attracted to the bright light of the clearing which could not be discerned in the forest at all. Forest paths were cut, too, in all directions, and here again the hunt was commonly profitable; Hingston, in fact, suggested that the best way to study the vertical distribution of life in the great forest would be to make a series of such roads, on which a wheeled platform one hundred feet high could be hauled along from tree to tree! The two botanists, Messrs. Sandwith and Paul Richards, adopted a different method. They searched until they had found what was thought to be the tree from which some particular blossom had fallen down. Their Indians were then told to build a platform above its massive buttresses, and with axe and cutlass it was hacked away until with a mighty crash it fell. If it fell on the clear side, well and good. There would be a rush to search it from end to end, to catch some sloth which had hauled itself to the upper side of the falling monster, to knock a tree snake on the head, or to trap some of the multitudinous ants, weevils, moths, centipedes, and strange things such as praying insects or leaf-hoppers; while as to the plants, the masses of moss and fungus, the beautiful ferns, orchids and other growths, their collection and drying demanded much time and patience. But if the tree did not fall clear, then hours would pass while the obstructing lianas or branches were removed; and this was necessarily a dangerous job.

Even with the assistance of the Indians, it was not easy at all times to get into or out of the canopy, for blocks would foul, ropes become twisted, and observers go spinning round; and owing to the height, if the means of ascent was not stoutly held by guy ropes, the swaying of the rope, or it may be of the rope ladder, brought the ascending naturalist up against the tree trunk with a bump. Once the Acting Governor of the Colony, the Hon. C. D. Douglas-Jones, paid them a visit and was hauled in the chair to the top of one of the highest trees. Then it was found that he could not get down again, the tackle having jammed, but eventually they brought him back safely from his 120-foot high perch. The view from above the canopy showed a rolling green mass of rounded tree tops, extending as far as the eye could see; above this common level giants rose at intervals for thirty or even forty feet, but such trees were relatively rare. There were masses of pink, yellow, purple and mauve blossoms, attended by bees, wasps and other insects. Spiders spun large webs, and built elaborate traps and shelters. Swallow-tailed butterflies, black-and-green, black-and-yellow, or a magnificent metallic blue, floated lazily about; and gorgeous blue, green or brown dragon-flies, which looked somewhat like model aircraft, were not uncommon. Humming-birds flashed past with almost incredible speed—one view of the rainbow hues flashing from their beautiful feathers, and they were gone. Monkeys gathered in neighbouring branches and roared defiance. Singular dirty-looking, long-haired sloths hung on to branches upside down,

crawling about in the same attitude, with a deliberation which fully justified their name. Most of this life, so abundant and varied, concealed itself amongst the leaves. One had to sit still on the platform, and to watch and wait, before one's eye could pick it out; nor was it easy at any time to detect stick insects, or those which so strangely resembled dying leaves, or the lizards which melted into the general colour scheme. The brilliantly coloured parrots, on the other hand, defied this natural law which ordained that each animal should blend with its surroundings. Birds there were up above, with all manner of voices from the gentle cu-cu of the dove to the harsh scream of the weird-looking toucan; but they were not easily caught, and if shot were liable to fall into inaccessible places. Ants of many kinds abounded, on the leaves, on branches and trunks, on the bush-ropes, and down below. Over the brown ground columns of them marched on forays, driving all small life before them. They climbed up the posts of the shelters, and under the tarpaulins, and down the strings upon which suspended specimens were drying; and not even grease could keep them away. There were few real pests, however, such as are so commonly spoken of as forest dangers; the chief being a tiny red mite, which caused an intolerable itching, and abundant ticks, which brushed on to one's skin from the leaves and then proceeded to dig themselves in. One necessary annoyance was the superabundant moisture. Everything was commonly dripping wet, at least in the wet season; a visit to the forest soaked one to the

skin. But this is no real hardship in that climate, and one soon gets used to it.

Traps of many kinds were employed by the naturalists—snap-traps on the ground, snares, blocking up holes in hollow trees, &c.,—as the result of which numerous small mammals, particularly rodents and bats, were captured. The most effective traps, however, were sets of muslin-covered frames, which were hung over a pulley from some branch in the canopy, one above another on a line reaching to the ground. These looked like strings of Chinese lanterns, particularly as they were illuminated by hurricane lamps at night. Under the top of each frame was a slot about one inch deep, through which insects could enter, egress being prevented by a tin shelf inside. The traps were baited with meat, molasses, &c., and the bottom was simply tied by a loop, so that on undoing the string the contents fell out. Generally thirty to forty inquisitive insects fell victim to these traps each night, but one rich haul numbered 164 individuals, including three beetles, seventy-two leafhoppers, a score or so of wasps, fifty-six moths, besides crickets, cockroaches, grasshoppers and a single spider.

Like most of the University expeditions, this one allowed only three months in the field; but even so, its results were very considerable, and if anyone could make a prolonged stay in that limitless forest, collecting and studying (as Wallace and Bates had done many years before), they would add enormously to our knowledge of biology.

CHAPTER IV

Dragons' Bones and Bandits in
the Gobi Desert

Imagine an immense oval plain, nearly flat, surrounded by the snowy mountains of China and Tibet on one side and the forested heights of Southern Siberia on the other, a plain where grassy steppes run out into barren, wind-swept sandy wastes, and where waterholes mark the two or three great caravan routes from Asia to Turkestan and Europe: such is the Gobi, one of the largest deserts on the globe. For thousands of years the only practicable routes across this waste have been on its edges, where water runs down from the surrounding mountains in rivers that lose themselves in salt marshes or brackish lakes; or in the centre, where a very difficult caravan route was reopened a few years ago because Chinese and Mongol bandits made the other two routes unsafe. This region, seemingly so desolate and unattractive, closed to travellers for seven months each year by furious gales and intense cold, has recently been much in the limelight, largely because two famous travellers accepted the truth of a scientist's dream and went to the Gobi to put that dream to the test. The first of these travellers was Mr. Roy Chapman Andrews, head of the American Museum of Natural History; the second was the sixty-year-old veteran of Central Asian and Tibetan

travel, hero of a dozen stirring exploits, Dr. Sven Hedin. Each of these men, disdaining to travel merely from one place to another and pick up whatever might interest them *en route*, led large parties of scientists who thoroughly swept the Gobi during a number of years. Sven Hedin worked in the west, where the beautiful Celestial Mountains, or Tian Shan, overlook the desolate marshes of Lob Nor and the Tarim Desert. Andrews, on the other hand, worked on the north-centre of the Gobi, and between the Altai Mountains and the forested country south of Lake Baikal. The Americans were first.

Now most biologists believe that animals in general, and particularly the four-footed, hairy mammals, are descended from simple, primitive creatures that lived on the earth millions of years ago. At the beginning of this century Professor Fairfield Osborn stated his belief that the centre whence primitive mammal life had sprung probably lay somewhere in Central Asia, perhaps in Mongolia or the Gobi Desert. Shortly after the first World War Dr. Andrews determined to examine on the spot whether this belief was justified. It could only be proved, of course, by finding fossil bones or the stone implements used by the earliest men; and to look for such things in a country that had nothing but brackish well water, a country ten times the size of England and Wales, where there were only two roads and both of these roads infested by murderous bandit gangs, was no light undertaking. Even Andrews, who had had the exploring itch in his bones since childhood, might have hesitated had

he known what difficulties and disappointments he was going to encounter. But with an infectious enthusiasm, he proceeded to get together a party of first-rate scientists, and to beg or borrow no less than four hundred thousand dollars. He determined to do the thing on the grand scale. Seven Dodge motor-cars would traverse the desert, comprising four separate parties. Each of these parties would be self-contained, with its own interpreter, its own assistants, camp equipment, and supplies. To ensure cohesion they would all meet at given times and places, or whenever the circumstances of the expedition demanded. In this way a very large area could be covered in a relatively short time. A movable base for the car parties was provided, in the shape of a camel caravan—camels are the traditional baggage animals of the Gobi, and camel drivers almost its only inhabitants—numbering 125 beasts, and carrying food, petrol, supplies of every kind. This worked as a unit, under the capable care of a trustworthy Mongol caravan-leader. The mental and physical make-up of each man was studied before he was accepted for the expedition. "Thoroughness pays", was the leader's motto; and it certainly did pay him, in that few scientific expeditions of modern times have reaped a richer harvest. Apart from searching for fossil bones (for which a number of prominent geologists were signed on), it was desired to increase the Museum's collection of modern animals; this fell largely to Dr. Andrews himself, who was a first-class shot and a keen hunter. A number of Chinese students were also engaged as

collectors and assistants, and wherever the many-armed expedition went its traps were spread, until in the end they collected thousands of skins, fishes, insects, reptiles, and so forth, besides a number of living creatures (including some young wild asses) which were kept in the hope of getting them to New York alive. Time and money being unimportant—how rare this is with any explorer!—years were to be spent in the work; so a headquarters was established in China, with workshops and offices.

At that time China was in the throes of civil war. The present central government (Marshal Chiang Kai Shek's) had not yet emerged, but was confined to Nanking. The north, where Andrews intended to work, was dominated by the fighting Marshal Chang Tso Lin. In addition, there were many minor leaders, who owed only nominal obedience to one or other of the greater military chiefs, and the farther one went into Mongolia the less respect was paid to Peking or Nanking. Moreover, large numbers of unpaid soldiers ran a profitable trade in robbing caravans and murdering peaceful travellers, and although they hesitated to shed the blood of a white foreigner, they were only too eager to rob him of everything he possessed. Behind all this was the age-old inertia and prejudice of the population, many of whom still believed in devils and spirits. To others the American "dragon-hunters" were obnoxious because China does a good business in fossils, which are sold for medicine in chemists' shops. The outlook before the Americans, therefore, was none too promising when, on 14th April, 1921,

Andrews arrived in Peking with a small party, in the midst of a dust storm. Very wisely, the first year was spent in getting acquainted with the officials who could help or hinder so much, coupled with preliminary fossil-collecting and the hunting of wild animals. Simplest methods paid best. When they wanted such things as snakes, frogs and similar small creatures, they called the children of a village together and set a price on each type; when a good many of any type came in the price went down; if it was rare the price went up. The keen hands and eyes of the children soon searched out far more things than any explorer could possibly have got for himself. Taxidermists were now engaged to skin and prepare the specimens.

Next year, on 17th April, 1922, the expedition really got under way from Peking to Kalgan, near the Great Wall; through here all northern and north-western caravans pass, and as the credentials of the Peking officials could not be accepted, fresh ones had to be obtained locally; and that, of course, meant money, delay and hospitality. From Kalgan a sort of road, soft, deeply rutted, and full of muddy pools, went up to the Great Wall, and it soon became clear that motor cars were not ideal vehicles for such a surface. Once they were outside the Wall, however, conditions improved. Before them stretched the immense grassy plains of Mongolia, merging imperceptibly into the forests in the north and the desert badlands in the west. Villages and corn fields lay near the Wall, the homes of soldiers and other robber bands, and, as a matter of policy, the expe-

dition hurried through this country as fast as they could. Out in the desert they met nothing, beyond an occasional felt yourt of some lonely Mongol family, or (more rarely) a monastery of lamas, brightly painted enough, and full of monks clad in greasy red and yellow robes, but smelling abominably as all such places do.

The start was disastrous. While trying to make too long a run as evening closed in, the leading car went off the road into a muddy swamp and was mired; the others followed it and were mired too. All but one of them soon got out, but that one required haulage by the entire party, reinforced by natives with blocks and tackle, before it would budge.

Once out among the grassy hills, Andrews hunted antelope across country from a car, bumping and leaping at forty miles an hour after those extraordinarily swift creatures. In the back of the car his expert camera man, Mr. J. B. Shackelford, took a cinematograph film of the chase. Some animals were shot, others were allowed to escape. One was deliberately timed. The car kept up with it at forty-one miles per hour for ten miles; then they had a puncture, stopped, and the antelope vanished far ahead. In the same way, Andrews on other occasions chased wild asses, securing the first specimens ever to be taken to America, likewise many big-horned ibex. One young ass was captured, tamed, and became friendly with a Chinese student, who used to feed it from a bottle; but eventually it sickened and died.

Meanwhile, the geologists were studying the line

of the country from their cars, and making a rough route map. Many rocks are far too old to contain such bones as those for which they were looking, but very soon they came to badlands near a place called Erlien, and such spots proved veritable treasure-houses of fossils. Badlands, by the way, are so called because it is so very difficult to get across them. They look, and are, like miniature editions of the Colorado Grand Canyon, having cliffs and the channels of ancient waterways in all directions. At one moment you may be on a level surface, the next you are looking down upon a valley two or three hundred feet below, with red, grey, yellow sand and clay beds in some cliff opposite that ends in a point; and beyond that may be other cliffs and valleys, small but very obstructive, by the dozen. Such places have commonly, ages since, been the sites of marshes and lakes; rivers that have long since dried up carved the cliffs, while the fierce Mongolian winds swept clouds of dust away, scooping out great hollows. The red beds rarely carry any bones, for the iron in them destroys such things; but the grey and yellow silty sands made the geologists eager to stop there and commence searching. Here it was that, almost at the start of the expedition, Mr. Walter Granger, fossil-hunter in chief, found bones of an extinct rhinoceros, the first ever discovered (apart from one which had been purchased in a shop) in China; and yet thousands of travellers had passed the spot. At a later date this place, and many like it, was explored more thoroughly. At another spot, the now famous Flaming Cliffs, they found

dinosaur bones, and eventually the monster's eggs. We will return to these discoveries later.

It was soon found that the existing maps were not nearly good enough for the expedition's purpose. Mountains appeared where there were no mountains, important caravan routes were not marked at all, and one lake was fifty miles out of its true position. Mapping therefore was added to the expedition's activities; and Major Roberts, a United States topographer, did this in a most interesting way, making a rapid reconnaissance map from a moving motor car. In the clear desert air, the hub, fender, radiator and windscreen of a car could be seen two miles ahead as clearly as if they formed a surveying staff. One car went ahead first, its distance being taken by specially checked speedometers. This car formed the foresight, and a second car similarly placed behind the observer's car formed the backsight. When the angle had been measured, the rear car was then signalled to go forward, the observer moved up, and a fresh reading was made. Levels were also taken regularly to show the height of the country above a known level on the Peking-Kalgan Railway. In this ingenious manner a route map of fifty-eight miles per day was constructed.

Years passed, and the Americans were still in the country. Each April they would be out with their cars and their camels, each September they returned to Peking laden with fossils, stones, skins, and live animals, despite a continually increasing local opposition. Unfortunately, Chang Tso Lin was defeated, so they then had to make friends with his con-

querors; during one whole year (1926), despite three desperate attempts, they failed to get through the brigand-country into the desert. On another occasion, all their precious finds (which included some of the most important that they had made) were impounded on their return to China, and another year passed in arguments and pleadings before they were released. For long spells the scientists went back to New York, and once or twice Dr. Andrews himself almost lost heart; but even after eleven years he was still to be found in Peking, and condoling with Sven Hedin on their common misfortunes. Naturally, in so long a time there were hosts of adventures. You will find many of these narrated in a most admirable travel book by the leader, *This Business of Exploring*. Here are one or two of the best.

Bandits frequently lay in wait for the cars, and it was the rule on such occasions to shoot at sight. They were cowards, if faced resolutely, however. Once, when near a village in the Gobi, five men appeared ahead and opened fire. As Andrews, who was driving, leaned back to take a rifle from his companion, who was in the back of the car, a bullet struck the steering wheel, just where he had been a moment earlier. They were going downhill at the time, and as luck would have it, they ran into a stream bed at the bottom and stuck there. The five men were about 350 yards away; as they approached, both Americans fired from behind the car, and dropped two bandits. The others then fled. On another occasion, Andrews was driving alone through

a deep valley when he spotted a rifle barrel above the rocks and shot a bullet at it instantly. The owner then disappeared. Two hundred yards farther on were four horsemen. Knowing that his car would frighten their mounts, he charged straight down the road at them; the ponies bolted, and he sent a few bullets singing round the owners' ears, sufficient to ensure his peace thereafter. Once his chief of transport, Mr. Mackenzie Young, fought off eleven bandits single-handed in this way, and escaped.

A more dangerous enemy was the large, half-wild and shaggy Mongolian dog, numbers of which were to be found near every village. They attacked the living and ate the dead. It is a local custom to expose dead bodies to the wolves; and these powerful dogs, who prowl around the cemeteries, have lost all fear of man. Every member of the expedition was attacked by them at one time or another, and nobody went far from the camp without a revolver; for nothing would stop these savage dogs but a bullet, when the pack would spring upon the dog which had been hit and tear it to pieces.

The Mongols themselves have some very good qualities. Wanderers all, it is a point of honour among them not to steal another man's mount, and they will go far out of their way to warn the traveller of some unexpected danger ahead. Escorts, however, were another thing. In 1928, the escorting liaison officer, who was supposed to protect them against bandits, was himself a head bandit; Andrews knew it, and the bandit knew that he knew it. A gentle hint that there were thirty white men all armed with

rifles, besides a machine-gun that could spit out 200 bullets every minute, ensured a safe passage on this occasion.

At one halting place, Wolf Camp, almost every member of the expedition shot one of those powerful enemies. At another, Viper Camp, the party was ignominiously beaten. Vipers are the only poisonous snakes in that region. After the camp had been pitched near some promising fossil beds, the weather became colder, and a number of vipers, wriggling up the rocks, crept into the camp for warmth. They got into the beds, the packing cases, one in a man's boot, another in a chauffeur's cap. There were dozens of them. Andrews trod on one, as he imagined, and sprang aside with a yell, only to find that it was a piece of rope, and the other men were as nervy. After fighting it out with the snakes for three whole days, during which forty-seven were killed, they broke camp rather than risk being bitten.

The wind was another and more persistent enemy; when it really blew all work came to a halt, for it had the fury and persistence of a Greenland gale, and was almost as cold. The storms sprang up with extraordinary swiftness. A small spot would appear in the blue sky, as if detaching itself from the distant hills. It became a whirling windstorm in a few minutes, rushing down upon the camp, sweeping clouds of sand before it, and making it difficult to breathe except with a damp cloth over one's mouth and with one's body pressed against the ground. While the sand swept around and into everything, the tents flapped madly, frequently being blown flat.

Once this went on for six whole days, during which nobody could stir abroad. Then it would clear away, and the brilliant colours of the barren cliffs would stand out once more against the yellow desert floor and the serene blue sky.

In 1922 they found a skull of a giant mammal, the largest except whales that ever lived. Several years afterwards they found a skeleton, with a jaw but no skull; later a huge skull, besides bones belonging to various animals of the same species, were unearthed. One found such things by looking in the cliffs, where they showed up white and conspicuous; one touch, alas, and the whole thing crumbled away into sand, it being excessively soft and decayed. The bones, of course, had long since been turned to stone. The animal itself had lived here, near where it died, in marshlands or beside some stream; and when it perished, sand and mud soon buried its huge carcass from view, the bones became separated, and some of the smaller ones were washed away. This monster was called *Baluchitherium*, i.e. wild beast of Baluchistan, because in that desert country fragments of one had been found twenty years before. The creature looked something like an enormous rhinoceros, but without its horn. It stood seventeen feet 9 inches high at the shoulder—as high as your first-floor window!—and was thirty-four feet long from nose to tail; its upper arm bone being as thick as a man's body and four feet long. It lived on vegetation, stretching up its thick neck to the foliage of trees.

Many other rhinoceros-like bones were discovered

by the Americans, but all much smaller than the giant just mentioned, and most of them very decayed. Another novelty was a spoon-jawed Mastodon, one of the ancient elephant-like creatures that roamed the earth long ago. Twenty of these great animals were discovered at one place, where they had evidently been caught in quicksands and sucked down. There were some signs at a neighbouring spot that some of these animals had gone down to a watering place to drink, taking their young ones, and that on realizing their danger the great beasts scrambled back, whereas the babies perished. At these two spots the expedition worked for six weeks, during which they unearthed 73 intact skulls, 115 scoop or shovel jaws, 25 ivory tusks, and many other parts. The bones were so soft that they had to be gently uncovered bit by bit, soaked in shellac to harden them, then bound round with rice paper and carefully packed; only expert fingers could do such work without damaging the specimens. When all the packing materials gave out, cloths were torn up, and even linen; one specimen even reached New York bound round with pieces of Dr. Andrews' pyjamas.

At other places they found great numbers of skulls and fragments, including even the small tail bones and impressions of the skin of ancient lizards known as Dinosaurs, including some giants. Their most spectacular discovery, however, was the dinosaurs' eggs, the first ever to be found. Near the Flaming Cliffs, which are about 500 miles south of Irkutsk, in the very centre of Asia, somebody dis-

cerned some bits of ancient ostrich egg-shell, which had been drilled for necklaces by a long-vanished race of men. Then bits of dinosaur egg were seen, and eventually complete eggs, in the nests, just as they had been laid. There were several kinds, and at first every alternative explanation of them was put forward, until the scientists became convinced that they really and truly were eggs; eggs, moreover, which had been in that state for perhaps twenty millions of years. Three eggs were seen first, brown oval bodies, and the ends of others were sticking out of the sand. A careful search revealed first a cluster of five, and then another nine, about eight inches long and seven inches round; they had a pebbled surface, as perfect as if laid only yesterday. From two of these eggs which had been broken they got out the delicate bones of an embryonic dinosaur; moreover, the skeleton of a small dinosaur was found in the sand four feet above the nest. This was in 1923. In 1928, at another spot, they found dozens of dinosaur eggs of a different kind. Some unsuspecting reptiles, long, long ago, had scooped out shallow holes in the sand, laid the eggs, and left them to their fate; and their fate was, to be dug up by scientists millions of years afterwards and put in glass cases for the admiration of American citizens!

Sven Hedin's party worked to the west and south-west of the Americans, and its results, though less sensational, were quite as valuable. He seems to have been inspired by the first successes of Dr. Andrews, to attempt similar work in the wind-swept oasis of Turfan (which lies below sea level, although

in the heart of Asia), and on both sides of the Celestial Mountains; ancient cities which Sven Hedin had been the first to discover many years before, and which the hungry sands of the Takla Makan had swallowed up, were also to be explored. Geology, biology, and particularly weather studies and other branches of physics, in which the Swedes have for long excelled, comprised the main part of the programme. The expedition, which was supported by the Swedish government, had abundant funds, motor cars, first-rate scientific equipment, and everything necessary for a long stay; behind them was the organizing ability of Sven Hedin himself, although it was no light task for this man of more than sixty summers to return to the hardships of his earlier travels.

The general name of Dzungaria is given to the region where they worked, a grassy, semi-arid country of nomads, across which the caravan tracks of ages led to Turkestan. It was controlled by the Chinese Governor of Sinkiang, whose headquarters were not far off, at the straggling town of Urumchi. This official, after some natural suspicion, proved helpful, but he was murdered, and his successor did everything in his power to wreck the expedition; nor did repeated orders from Nanking shake him in the least. Sven Hedin, however, was not the man to be deterred by Chinese opposition, and for eight long years from 1926 onwards he maintained the struggle, now in Urumchi, now in some outpost of the government, now in Peking or Nanking; and throughout that time his scientists, split up in ones

and twos, continued their work, and by fair means or foul were maintained with supplies.

One river only crosses the Gobi, running from the Chinese Nan Shan northwards into the desert, drying up completely at times, and ending in a salt lake with no outlet. On this stream, the Etsin Gol, Major Zimmermann set up the first of several meteorological stations, the first true weather station ever to be established in an area as large as Australia. Here, with the aid of a Swedish missionary-adventurer named Soderbom, and a Chinese student named Ma, he maintained himself under great difficulties for nineteen months without a break. Thermometers and barometers were set up, and regular readings were taken throughout the day and night of sun and ground temperatures, water temperatures when there was any water, and the daily weather observed. They lived in a felt youirt, with a petrol tin for a stove, and a stove pipe made from jam-pots; the station stood among a grove of leafless poplars, backed by dunes and bushes, the better to keep off the fierce northern gales. Everything that the Swedes did, every strange action of the white magicians, was watched by the native Torguts, and was duly reported to Urumchi or Su-Chou. Some shining metal cylinders of hydrogen gas, which was used for filling weather balloons, were confidently rumoured to be disguised cannon; and when the balloons went up (really, of course, for the observation of the temperature, &c., at high altitudes), it became obvious that the foreigners were sending messages to enemy states. Spies now came and went with alarming

frequency; and when it was found that the Swedes refused to take hints to leave, first Ma, and then Soderbom, were marched off to Su-Chou under escort, and for some time were imprisoned there. The Major, however, stuck to his post, threatening to meet violence with violence, and so he was allowed to stay. He made himself a garden, planting vegetables in it, which provided a welcome change of fare. During the winter the river froze, the temperature dropping to minus fifty degrees Fahrenheit, or almost as severe weather as Courtauld encountered in the middle of the Greenland Ice Cap. During the summer, on the other hand, the thermometer soared to 108 degrees, the river dried up, and he had even to dig a well in order to obtain water; at this season gnats, mosquitoes, poisonous scorpions and spiders abounded. Snakes also sought shelter in the camp, Zimmermann killing three within his tent.

After his friends were released, they returned to the station, where it was soon noticed that the student Ma had changed. This young man, whose conduct hitherto had been excellent, now showed signs of brain disease; and in a fit of madness he first murdered a Chinese servant with an axe and then hacked himself to death. This shocking tragedy did the expedition no good, although the cause of the crime was plainly proved by the local officials. Finally, after nineteen months, the station was dismantled.

A second party, under Dr. Erik Norin, mapped the country, made collections of fossils, and studied the curious behaviour of the co-called "wandering

lake", Lop Nor. When Sven Hedin had floated down the long, winding Tarim River more than twenty years before, he found it to end in the marshes of Lop Nor, a large, shallow, reedy lake, surrounded by desert sands. Now, however, the lake had changed its place, the reason being that the river too had changed its course, and was emptying into an adjacent depression. With Norin there worked for a long time the chief physicist, Dr. Nils Ambolt; his principal aim was to study gravity in the great hollows which mark this part of Asia, and particularly the Turfan Oasis. He had to make fine measurements with highly sensitive pendulums, not infrequently at spots where a sudden gale might at any time sweep over the hollow, wreck the temporary building, and ruin the instruments. One such gale did, in fact, upset the plane-table with which Norin was surveying; another, which lasted for six days on end, gave rise to a complaint by the natives that the foreigners had unloosed the spirits of the wind, and they prayed that the Governor would suitably punish the said foreigners for all the mischief that they had caused!

Sven Hedin, although doing everything that he could to counter such complaints, was continually obstructed by the Sinkiang officials, and even he spent a short time in a sort of honourable detention; for the revolution had made everybody nervous of everyone else. But partly by guile, and partly in defiance of the local conservatism, a great deal of scientific matter was gradually accumulated. When the police inquired into the dragon bones for which

the Swedes were seeking, a Chinese student astutely led them to the wrong place and provided them with a few relatively worthless specimens. Another geologist, the Chinese Professor P. L. Yuan, made numerous discoveries of dinosaur bones, including some eggs. These finds, though less sensational than those of the Americans, led a French newspaper reporter to state that Hedin's expedition had actually discovered "thirty full-grown living dinosaurs". And he added, "This is the first time that anyone has discovered living specimens of these animals." Evidently he had not heard of that eminent scientist, Professor Challenger, of "Lost World" fame!

Sven Hedin also took out a number of archaeologists, who, by exploring the old trade routes from China along the desert's edge, made large collections of relics and stone implements, in a region which that science had hitherto completely ignored.

It is interesting to recall that while the two large American and Swedish parties were at work in the Gobi, helped by the motor car and other modern inventions, a solitary Englishman, Mr. Owen Lattimore, travelled with a native caravan through the heart of the great desert for more than a year. He spoke their language, and he dressed and lived exactly like his Chinese companions, the descendants of men who for twenty centuries had made such journeys, with all their wealth on their camels' backs. As we stated earlier, the wandering bands of lawless soldiers, together with the ever-present professional banditti, made the two age-old caravan routes so dangerous that this caravan selected a new one. It

was a little-known track through the very centre of the desert, midway between the others, free from danger other than death to the camels through starvation and to their owners through thirst; for waterholes were few and far between. We have no space to more than mention Mr. Lattimore's journey here, as a strange contrast to what was going on elsewhere in the desert at that time; but he, too, had his adventures, and doubtless he would not for worlds have changed places with Andrews or Sven Hedin. You will find the story in his book, *Desert Road to Turkestan*.

CHAPTER V

Borderlands of the Amazon

We have seen how an expedition fared which spent several months alone in a tiny clearing among the Guiana forests. Let us now follow the fortunes of a party who, by the most strenuous efforts, succeeded in penetrating one of the wildest and most difficult countries in the world, the adjacent region where the northern tributaries of the mighty Amazon take their rise. The main waterway here, the Rio Negro, which is more than ten times as wide as the Thames at Westminster, pours its immense flood of coffee-coloured water into the Amazon just below Manaos, 1500 miles from the sea; and to that point large ocean steamers can ascend. The upper part of

the Negro, tumbling over many bad sandstone ledges, and encircling innumerable islands, is joined to that other huge stream, the Orinoco, by a natural canal, thus converting the Guianas and all northern Brazil into an enormous island. It is in the north-western part of this "island" that our journey lies, a district which from the air shows nothing but the rounded tops of countless trees, the leafy summits of a continuous dense forest that climbs up the precipices, spreads across the flat-topped mountains, and buries even the rivers at many a point beneath its shade; through this wild country the feeders of the Rio Negro gnaw and thunder and tear on their way to the south. Here too, admirably hidden by the perpetual verdure, and living in communal huts called malocas, many savage tribes of coffee-coloured Indians eke out a perilous existence; they spear fish, they track down game with their long blow-pipes and poisoned darts, and not infrequently they hunt each other. Wherever there is a clearing or a sandbank myriads of noxious insects and other nasty things abound; into this territory white men enter at their peril. Through the middle of the wilderness runs the Rio Branco, or White River, turning south to empty into the Negro, or Black River, some distance above Manaos. To map the Rio Branco from end to end was the ambition of Dr. A. Hamilton Rice when he took a large party of Americans there, equipped with every device of the modern traveller, during the summer of 1924.

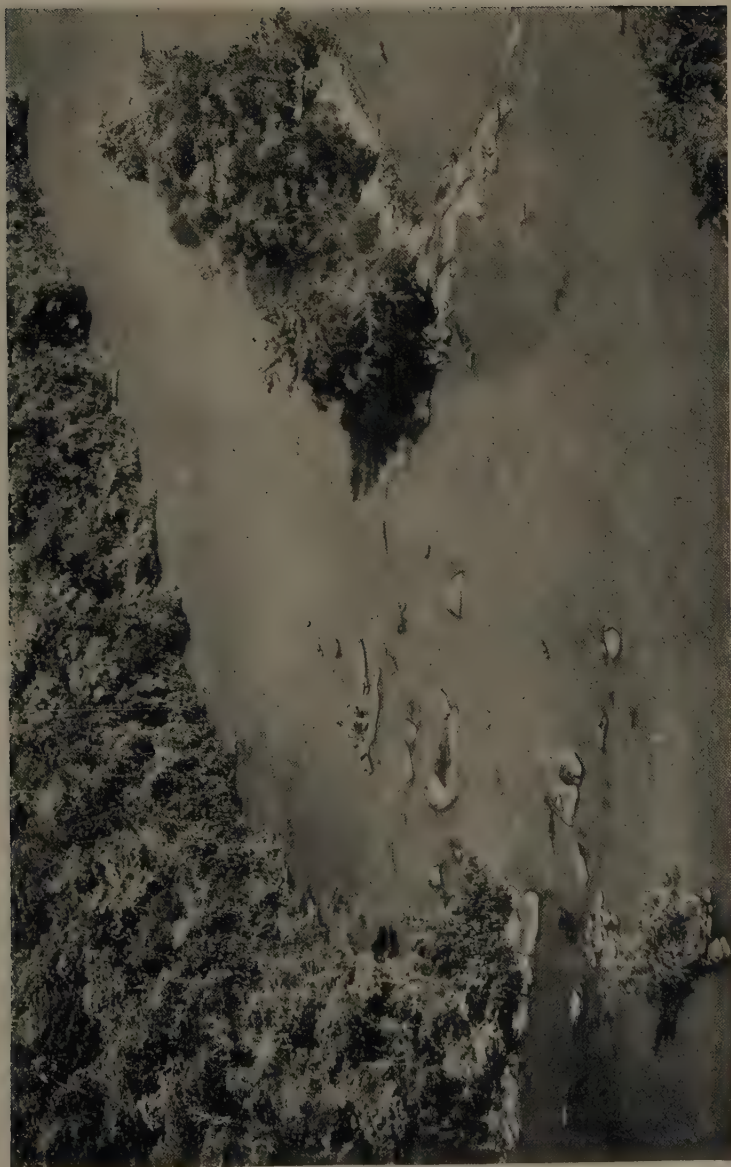
Dr. Rice was no stranger to the country; on the contrary, this was his seventh visit to the Amazon.

As on all his former journeys, he had a second object in view, for he was a medical man, skilled and deeply interested in the terrible tropical diseases which are only too abundant there; and as many of these diseases may be acquired simply from the bite of a fly or a mosquito, you will appreciate that it requires more than mere animal courage to venture into such plague spots. The doctor literally travelled with a sextant in one pocket and a test tube in another; and after taking a round of angles, to mark the course of a stream or the position of a hill, he would be found in the nearest village, examining the sores of an indifferent, apathetic and stoical Indian. He himself bore a charmed life, but his work was decidedly dangerous, and during his various journeys more than one of his talented colleagues succumbed to the fevers of the country.

Some years earlier, Dr. Rice had built a launch, the *Eleanor II*, for the express purpose of working on these difficult waterways. This vessel was now equipped anew; and he took, besides, a large punt or scow, for carrying heavy stores upstream, a canoe with an outboard motor, and a number of the native dugout canoes, each of which was made from a single trunk. The rivers to be mapped were known to be wide, shallow, and continually splitting into numerous channels around a maze of islands. In order to observe the best route, he therefore took an aeroplane. Finally, the radio equipment, which by picking up time signals would enable the map to be made more speedily, and by transmitting news from the jungle would keep the explorers in touch with

their friends at home, was exceptionally good; it cost six thousand dollars, which was more than Wallace and Bates spent altogether during their many years on the Amazon. Both the plane and the wireless proved invaluable; but at that date both were novelties, and they gave those who had to use them not a few anxious moments.

The aircraft, a Curtiss Sea Gull hydroplane, was a biplane, which at a cruising speed of seventy miles per hour, could carry two persons for three or four hours. Its pilot, Lieut. Walter Hinton, had been loaned by the U.S. Navy, and the observer, Captain A. W. Stevens, came from the U.S. Air Service. It was intended that the plane should scout ahead of the main party, take back photographs of the route to be followed (and magnificent photographs they were!), and then reconnoitre ahead once more. This meant that a constant supply of petrol had to be available; and as there are no airports in the Brazilian wilderness the petrol was taken upstream in the scow and canoes, and was dumped at depots all along the river. The Sea Gull made so many journeys to and fro that she covered more than 12,000 miles; but it was not easy going by any means. We have said that the upper part of the river tumbled down to the Negro. It did more than that; in fact, at some spots it went mad, roaring through narrow gullies, with whirlpools that shot up spouts of water, or leaping among rocks and over shoals, or sweeping silently, but with deadly speed, under branches that almost touched its inky surface. Upon this river the plane must land, nor were



there many places where that could be done in safety. Although a typical "white-water" stream, i.e. one which was thick with sediment and often flecked with foam, the Rio Branco had its dark patches too, which from above offered no feature by which one could judge the distance. The pilot therefore had the choice of trying to get down on the crest of a mill-race, or of smashing heavily against the glassy surface of a dark-water patch before he realized that he had hit it; but by skill and luck they had only a single accident. To rise again in the morning was another problem, because stretches of quiet water were usually terminated downstream by a roaring cascade and upstream by a bend; thus whenever the aviators took off they seemed to be charging straight into the trees ahead, and in fact they often skimmed dangerously close over the topmost branches. Even navigation aloft had its peculiarities; for if they failed to follow the windings of the particular stream they were above, it was highly likely that they would pick up some other and altogether similar stream, and that they would then be forced to cruise about, on a short petrol supply, with the uncomfortable thought of a crash among the trees, and complete disaster. At night the aircraft was anchored as a rule in midstream; but when the current was abnormally swift they took her inshore, being careful to keep away from overhanging branches; the penalty for neglecting this precaution was that countless ants would stream aboard and eat up the fabric. Spiders were another nuisance. Every morning the Sea Gull was festooned with their

webs; and if the tubes that operated the airspeed meter were not cleaned out each day, the meter was sure to register nothing. You will see from all this that flying on the Rio Branco had its drawbacks.

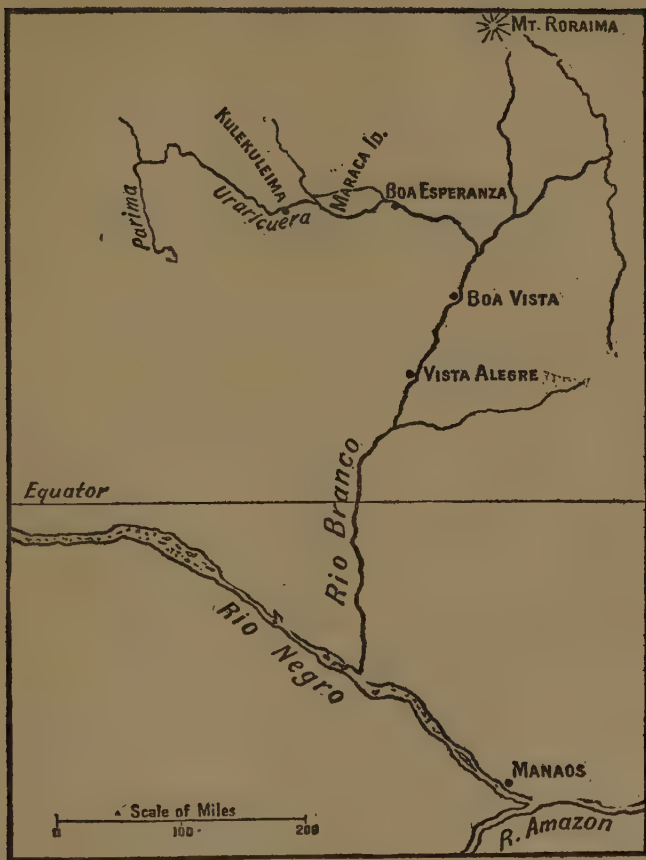
The wireless experts, Messrs. J. W. Swanson and T. S. McCaleb, likewise had problems and difficulties to surmount. At the very start, they had only just begun to make experiments at Manaos, when a revolution broke out there; this disturbance lasted six weeks, during which every action of the "Americans" was naturally regarded with the greatest suspicion. Once away, however, and out in the wilderness, a number of trees had to be cut down before the wireless people could use their instruments so as to give a clear space for transmission. One tree, eighty feet or more in height, was commonly employed as the transmission mast; but for receiving messages they merely laid out thirty feet of wire within a foot of the ground. The transmitter was worked by a generator driven by a kerosene motor, hence oil had to be taken along. The advance party had a small, 25-watt short-wave transmitter as well. It had been intended to use Manaos as the wireless base, but unluckily the supply of an essential tube ran out. They therefore had to make short-wave contact with the United States, 3000 miles away; the message was then cabled from the U.S.A. to Para, another 3000 miles; thence it was cabled to Manaos, another 1500 miles; although Manaos itself was only 400 miles in an air line from the party! The short-wave messages were

picked up in England, and even a New Zealand amateur received them, 8500 miles away.

Like the aviators, the wireless men were plagued night and day by countless insects. The short-wave set not infrequently was found to be full of ants, and on one occasion hornets took possession of it, building their nests in the crevices; we are not told how they were induced to leave!

Everything being assembled at last, the expedition left Manaos on board an old stern-wheel paddle steamer and immediately crossed a much-dreaded part of the Rio Negro, where the stream is four miles wide and storm waves frequently capsize small craft. Thanks to the broken water astern of the steamer, the pilot of the plane, following in their wake, was enabled to surface his machine without a smash. The Rio Negro splits into many channels, separated by long, narrow islands; the safest of these channels forms a sort of natural canal, through which the party ascended to the tiny settlement of Carvoeira. There they turned north up the Rio Branco, whose immense surface was soon as much split up by forested islands as that of the Negro itself. Imagine a high green wall of foliage stretching mile after mile to the north, the trunks almost bathed by the river, the branches intertwining overhead, or at rare intervals shooting head and shoulders above their neighbours. The bank rises, and there is a strip of glittering white sand; land upon it and you will be sure to find many a turtle and scores of their eggs. The bank falls, reeds and swamp appear, and here noble palms rise in many shapes.

The islands in midstream seem to be engaged in a perpetual struggle to keep their superabundant plant life above water; the far bank is too remote to be distinguished clearly, even if it be visible at all. Birds and blossoms there are in abundance; and at rare places some mouldering timber shack, or (much more infrequently), a moisture-stained brick house, shows that man is struggling to keep alive among the myriad insects and other pests of the place. Such is the ascent of the Rio Branco, as of many another Amazon waterway. There are deep pools where the stream flows silently yet with immense force against you, there are riffles and shoals, eddies and back-waters without number, tree trunks falling into the river, fish-traps and the gently rocking outlines of dugout canoes. Indians, hidden among the bushes, look curiously at the aeroplane as she roars away overhead; *they* have heard of such things, but their kindred far upstream still regard them as some sort of giant bird-man. Night falls, and the trail of the steamer, which at first had been marked by a volume of smoke, now shows up in a succession of fiery sparks. Frogs begin their eternal croak, and owls hoot unseen in the dark masses of forest ashore; and meanwhile you are slowly but surely advancing into the unknown, until the sudden advent of a tropical night brings you to a halt. Next day it is the same, and the day after that. Throughout this time you have your notebook, your compass, your pencil, and as the course changes you mark out the angles which are to be the basis of your map; this work, of course, can never cease, until you stand at



THE RIO BRANCO

the river's source. By day you take time signals, by night you take angular measurements of certain stars. It seems a great deal of labour, merely to record a winding line on a map, but believe me, it is vastly interesting.

A fortnight after leaving Manaos, they reached Vista Alegre, a small port 250 miles up the Rio Branco; here the cargo was unloaded, the plane overhauled, and the first base established. Immediately above this place one could hear the rush of water as the river tumbled over its first rapids; there was a canal past them, but the steamer had to turn back, the *Eleanor II* accompanying her in order to get more supplies. From this point upwards rapids were an ever-increasing vexation. They were formed as a rule by sandstone ledges that ran almost or quite across the river; through gaps in such ledges the water hurled itself with great fury, small craft tending to dive vertically down to the bottom. There might be some spot where, by partially unloading the canoes, and then man-handling them with double crews, they could be forced into the calmer water above; or they would be lifted bodily above the rocks. Should they be caught in one of the innumerable whirlpools, where the water rushed and boiled between the rocks, the heavy craft would swing round broadside-on, and then be tossed up and submerged in the twinkling of an eye; and if the crew escaped with a ducking they were lucky. If the drop was very bad, so that the river hurled itself over a true fall, it would be necessary to get ashore—no easy task, as a rule!—as near as possible

below the obstacle; then all hands would be set to cutting a path through the jungle to the nearest point above the falls, this path would be lined with branches, and over the rough road thus made the entire party would haul and push, sweating in the heat and glare, to get the heavy canoes up. Such was the life to which Hamilton Rice and his people had now committed themselves for several months on end.

About one hundred miles above the first rapids they came to Boa Vista, the last outpost of civilization, and a relatively enormous town of 1200 people, whites, Indians, half-castes and Negroes, rubber-collectors, traders, fishermen, hunters, and idlers. Although extremely unhealthy—for the forest had now thinned out and insect pests had full play—Boa Vista became the expedition's main base. The wireless party and the plane had been sent ahead, only to find that there was no timber suitable for an aerial mast; they actually had to go four days' journey upstream, cut some suitable trunks, and float them down to Boa Vista, before they could erect their masts. As wild cattle roamed the surrounding plain, a barbed wire fence was built round the station. Then McCaleb became seriously ill, and so remained for a fortnight; meanwhile his companion made the unpleasant discovery, noted above, that Manaos was not receiving their messages. When the main party reached Boa Vista, the engineer of the launch also fell ill; and it was 3rd December before the *Eleanor II*, towing a string of canoes, again set out. Twenty miles above Boa Vista the Rio

Branco as such ends. Its main headwater, the Uraricuera (a name which means "rapid water," flowing through country where the deadly vegetable poison curare is gathered by the Indians) was the branch to be mapped; and it was only now that the party's troubles really began. At first it seemed a magnificent stream, with rich open country on both sides, the banks lined by reeds and winding away into many an oozy pond; here thousands and thousands of waterfowl of every kind screamed and chattered and hid by the side of the splendid palms. In the water swam fish, some innocent, some hideous and deadly dangerous, with huge mouths and spine-like teeth; and farther up there were electric eels, capable of administering a numbing shock. As the boats advanced, the speed of the stream against them became heavier, and it was soon evident that the launch could not go much farther, and that canoes must now be relied on for all transport upstream. At Boa Esperanza—two houses and an orange grove, in the midst of the increasingly dense forest—the last base was established. An aerial was erected, stores were relayed up, and the bole of a huge hollow tree was cleared of its nasty creeping things, so as to serve as a dark-room for the photographer. At Boa Esperanza one Cyro Dantos, a river trader, was engaged as overseer of the canoe-men, many of whom now had to be recruited by a search of the surrounding country.

A little way below this spot was a dangerous reef where one of the Indians who was bringing goods up to Boa Vista lost his balance and fell overboard. He

was drowned. A few days later two young Indians went there in another canoe to search for his body. They, too, were upset at the same place, both being drowned. The natives all believed that there lay a huge river serpent, or anaconda, under the surface, which had dragged the men down to their deaths; but it is just as likely that the strong suction of the whirlpool was responsible. Expert canoemen though they are, the Indians are highly superstitious; nor was it easy to keep them in a good humour, for they were mightily afraid of the "savage" Indians who dwelt towards the river's head.

The way narrowed, islands came in sight, and calm stretches of water became rarer and rarer. The first party to go upstream from Boa Esperanza gained only three or four miles a day; but it *was* a gain, and that was all that mattered. Soon the river split, to enclose a large island about the size and shape of the Isle of Wight. The plane explored both routes, the pilot reporting that the southern one was a continuous sheet of foam and probably impassable, but that possibly something could be made of the northern arm. Twenty-four miles up there was a nasty obstruction, Typurema Rapids, but it offered a camping site, although it took the main party a month to get there. Meanwhile, the Sea Gull had hopped forward again, past many raging cascades and one great waterfall, fifty miles to Kulekuleima, another good site in the wilderness. Here, in days gone by, two tribes of the Indians had been at war; and one of them, taken by surprise, had been massacred on the forest edge, until the rocks were

said to be red with blood. There were wild Indians about still, but contact was established with them, and eventually they provided canoemen for another stage of the journey. On Christmas Eve, when the Sea Gull was returning from its first visit to this spot, they came to grief just above Typurema Falls. They ran the aircraft on to a submerged rock, and in getting it off damaged it so much that they had to beach it on a sand bar. Then they had to wait as patiently as they could for several days, until the river fell sufficiently for them to get at the bottom of the plane and repair her; and then came another wait of several days more, until it rained, and the river rose enough for them to dig a channel round the plane and float it off. They lost eleven days by this accident.

Twenty-five miles above Typurema was a still more serious obstacle, the river gathering itself into a deep, cliffy cutting and roaring madly down a narrow channel, with three great leaps and a total drop of ninety feet. This was Purumane Falls. Nothing could be done but go ashore and cut a road through the forest. All this time, of course, canoes were coming and going after the various parties, moving petrol, food, stores, and tools upstream.

Above Purumane it became worse than ever. No crew could row against the current, and the only possible way to get on was to lay out cables and man-haul the craft over the slippery rocks, with men in the water up to their waists pushing as well. At one point the punt, which was insufficiently manned, got out of hand, was swept round in an instant, and

became firmly jammed between two great boulders in deep water; it took two hours' work by eight men with axes to free it again. The fear of savages was another hindrance, for the Indians would not move forward, except in a body; and when one of them saw a footprint in the forest, all his fellows declared that this was an omen and that the hill savages would assuredly kill anyone who entered their country. But by fair treatment, coupled with calmness and patience, the crews were kept in hand. Violence would only have resulted in a wholesale desertion.

The canoes were now badly damaged by the rough treatment they had received. They were patched and their seams caulked, the material used being a pitch-like mass made by boiling the sap of the sorba tree. As for food, the party never went short. Tapirs were caught occasionally, the animals being quite fearless, as if unaccustomed to see man; but in that climate, the meat had to be smoke-dried over greenwood fires, a long and tedious operation. There was plenty of other game—peccaries and deer, not to mention large monkeys, tortoises, and many edible birds, including pheasants, turkeys and partridges. The river was full of fine fish; but caution had to be exercised here, because of the terrible piranhas, large, hideous and ferocious fishes, which could only be caught by the stoutest hooks hung on strong wire lines. In camp, one had to keep a careful watch on *tucandeiras*, giant ants the bite of which was extremely painful, not to mention clouds of small biting flies in the air and colonies of

ticks and red bugs on the ground. Sometimes they saw large spiders, one measuring $10\frac{1}{2}$ inches between its leg tips; these are usually bird-eaters, but they can give one a nasty shock. Five anacondas or giant water boas were killed between Typurema and Kulekuleima; many venomous serpents were seen, and once a snake crawled down the aerial towards McCaleb, who was transmitting a message. Without stopping for a moment, he picked up a knife with his free hand and chopped its head off. Forest birds were numerous, including brilliantly coloured macaws, Amazon parrots, the queer-looking toucans, besides small birds of many kinds; far above, flying with lazy ease above the tree-tops of the hateful forest, hawks serenely looked for their prey.

The route to Kulekuleima became worse and worse. At one place the river ran like a mill-race, with a fall at its head so large that they went back to find another channel. What appeared to be one was soon found, but the first canoe to enter it got out of control, swept broadside-on, overturned, and hurled all its contents of food boxes, clothes bags and petrol tins into the river. The Indians, who were all fearless swimmers, saved most of the floating things before they had drifted far; others dived to the bottom, eight feet down, to retrieve the heavier items. To crown everything, the route led nowhere, a squall of rain came on, darkness supervened, and one-half of the party had to encamp at some distance from the rest. Next day they tried the mill-race again, and after a long search got through, in a channel no wider than a brook, with

overlacing branches and practically no water on the bottom. At last, 19th February, they reached the rocks at Kulekuleima, a beautiful spot where two great reefs ran across the river. At one place was a rocky islet, covered with thousands of orchids in flower; high trees, some of them thick with yellow bloom, crowded down to the water everywhere. Just above the fall was a quiet haven where the plane could lie; just below it was a brilliantly white beach of sand. It was here that formerly, during a fierce battle between two tribes of Indians, one of them, the Maracaras, was almost exterminated.

A halt ensued in the mapping, while the plane went on to reconnoitre the two last headstreams, and more petrol was brought up. The Indians from Boa Esperanza now became very restive and, although good watermen, had to be released. Their place was largely taken, however, by the half-wild tribe, known as Maiongongs, who lived locally in large communal houses, and who now began to crowd round the camp. They were short, muscular, olive-brown men, fairly strong, and accompanied by women, children, and many scraggy dogs. They lived in clearings in the forest, in which they erected stout circular beehive-shaped houses up to eighty feet in diameter but only five or six feet high at the centre; each house had a clear space in the middle, from which cubicles ran to the wall, one for each family. The Indians lived on fish, bananas, and a few other vegetable products. They were armed with enormous bows more than six feet long, their arrows and spears being tipped with bone. They

were far more cunning than they appeared to be, and had in fact had some slight association with white men. By patience and tact, a number of them were eventually engaged to replace those of the earlier crews who insisted on returning home. Meanwhile jaguars prowled around the camp; but the noise, the dogs, and the nightly fires kept them off.

A small party succeeded in dumping petrol 112 miles farther upstream, and thither the plane now went on its final reconnaissance. The headstream of the Uraricuera, which bore the name Parima, ran for another hundred miles beyond this dump, and the plane reported that it seemed impassable; nevertheless, it had to be ascended, for only from its head could they tie in their survey to a known point in the mountains. The plane was therefore ordered back to Manaos, and the expedition, relying on canoes alone, pushed on. On nearing the dump they landed and found a hut where the fire was still smoking; soon afterwards they met two Indians and a boy, who gave them eighteen pineapples. Farther inland the tribe to which these people belonged was found, housed in a malloca eighty feet across but only three and a half feet high. The people were naked, ill nourished and dirty, their bodies being stained blue; they had nothing to live upon but some horrible banana beer. Later, a richer community was met, the people owning numerous bows, arrows, quivers, blow-guns, spears, curare pots for mixing poison, mandioca presses for making meal, besides stools, hammocks, fire pans, fish traps, and plenty of mandioca beer. Everyone was offered

beer, together with small pots of food and fiery pepper, likewise delicious bananas, both cooked and raw. The friendly reception was due to the fact that Dr. Rice's pilot, one Rozendo, lived there. At another camp, just below where the Parima swept impressively into the main stream, the Indians held a ceremonial dance in honour of their visitors. Immense quantities of banana beer were drunk. A canoeman, who had a dozen birds hung round his neck, beat upon a native drum, while his comrades twisted and turned and stamped, accompanied by an accordion that could muster three notes only, and refreshing themselves by beer at frequent intervals.

The Parima emerged from a narrow and winding gorge, buried in vegetation, with hills on either side which were just as effectively tree-clad, even on their summits. The sandstone walls were smooth and treacherous. Paths had sometimes to be cut through the dense jungle; but somehow the canoes were pulled, pushed or carried upstream. At one point, while passing close to the left bank, a great boa swung down from an overhanging branch and made a pass at one of the canoes, but then thought better of it and withdrew again. The Maku Indians displayed great skill, pulling the canoes along by seizing the branches of the trees, at the same time as with their feet they fended off the canoes from rocks or other half-hidden dangers below. At last they came to a couple of rope bridges, both of which had been broken; here, although quite close to its source, the river was still 112 feet wide. Then it narrowed to a mad rapid not five yards across; two canoes were

lost there, with all their foodstuffs, tools, axes and ammunition. Immediately above this point was a fall; near here one of the pilots shot a tapir which suddenly raised itself out of the water on a submerged tree trunk. The body sank immediately, but two of the Makus, diving in, brought it up with a palm cord rope through its nostrils; and it was hauled ashore amid general rejoicing. Whenever a hunt of this sort started, the canoemen could not be restrained until it was over.

At last they came to a pool into which the head of the river rushed; canoes could go no farther, but by cutting a path along the wet and slippery shore, in mist and rain, the explorers proved their stream to be now only a mountain torrent. This was the head of the Rio Branco. A cliffy hill rose behind; and beyond that, at a spot which yet had to be identified, the great river Orinoco took its rise. The Indians were therefore induced to cut a path up the hillside, so as to establish an observation post. While thus engaged, the cry, "Bravo!" i.e. "Savage!" suddenly echoed over the hill. Two of the Makus ran away, but the rest stood firm; then the cause of all the commotion, a harmless Indian, old and feeble, with a bow and three arrows, stood out in the path. He was followed by another. Friendly signs were made; then the strangers uttered wild cries, and suddenly many more Indians appeared, all round the party. They had been watching all the time, undetected. Dr. Rice induced them to lay down their weapons; and after confidence had been established, they all repaired to the malloca

of the savages, not one of whom wore a stitch of clothing. Hatchets and cheap clasp knives were given to them, and they became quite friendly. Such was the expedition's only encounter with the dreaded Guaharibos.

On 3rd April, the necessary tie-up with the Orinoco's source having been made, camp was broken and the return journey began. Naturally it was much easier than the ascent, but it was full of thrills and danger nevertheless, for it requires great skill and judgment to avoid an upset in such dangerous waterways. The canoes made the return journey to Boa Vista in twenty days, partly over a new route, for it was decided to attempt the southern part of the Uraricuera where it sweeps round Maraca Island. This stage proved to be infinitely worse than the northern route, with many channels so narrow and shallow that rocks had to be prized up before the canoes would pass; and everywhere in such places, of course, the vegetation met overhead. Once engulfed in such a leafy tunnel, only one or perhaps two other canoes could be seen; in fact, not more than two of the crew ever succeeded in camping together. But at last it was all over, the stream broadened out into the rich grazing ground at Boa Vista, and another little line had been permanently inscribed on the map of the Amazon.

CHAPTER VI

North-West Passage

Throughout the month of June, 1928, the world was thrilled by the wreck of the *Italia* and the still undetermined fate of her survivors. The *Italia*, an airship commanded by General Nobile, had been intended to cross the Arctic Ocean with an international party of scientists on board. When some distance north of Spitsbergen she crash-landed upon an ice-floe, tearing off one of the gondolas, and hurling out ten men. The airship, out of control, flew on a little further, and crashed again. No news was received from either scene of disaster for a fortnight, or until 8th June, when a roundabout message showed that at least one party was still alive.

Efforts were set on foot at once by several nations to rescue the unfortunate men; but the survivors were hidden by mist, separated by many miles of shifting ice-floes from any inhabited place, and even their true position was not known with any certainty. Captain Otto Sverdrup, the Norwegian hero of many a polar exploit, recommended sending out a Russian ice-breaker; and it was this ship which eventually brought back several survivors. Other brave men thought of flying to their relief; and one, a Swede, actually found the party which contained General Nobile, carried him to Spitsbergen, and then crashed among the other Italians on his second flight.

Another of the would-be rescuers, with two companions, set out in a Latham seaplane from Tromsø, by order of the French Government, on 18th June, and never returned. He was a stocky, hard, grey-haired Norseman of fifty-six, his name Roald Amundsen; his companions were Lieutenant Dietrichsen, who had been with his leader in many a tight corner, and a French pilot, Captain Guilbaud. Amundsen had been lost so often before, only to return after the most amazing escape from death, that at first nobody worried much. He was on the floes. Somehow—that wonderful “somehow”, which had stiffened the giant Nansen into a do-or-die struggle against tremendous odds, and which meant much, even to the more calculating Amundsen—somehow he would cross the lanes between the ice, would find or make a craft, and would turn up at last, triumphantly. This time, however, there was to be no return. Many weeks slipped by, and then at last a float from the plane drifted up to one of the Lofoten Islands, a mute witness that the errand of mercy had failed, and that it had cost the three men their lives. The greatest explorer of modern times was dead; for all his superficial faults, he had the heart of a hero, and like a hero he had died in the noble duty of trying to succour others.

For mark you, Captain Roald Amundsen was no ordinary explorer; not since Stanley have we seen his like. Sixteen years before this disaster, he had been the first man to march to the South Pole; fifteen years before that, when mate of the *Belgica*, he had tasted to the full the rigours of an Antarctic

winter. As a boy, he had deliberately decided that polar exploration was his bent; and being determined to brook no superior command, he had sufficient strength of character to spend two years before the mast, learning his business as a seaman. Amundsen, who has been—quite wrongly—described as impetuous, always thought a very long way ahead; thus, when the close of the war of 1914-18 brought free aerial navigation again, he was among the first to seize the possibilities of the air in opening up Arctic secret places. Dogged for a long time by monetary and other misfortunes, he persisted until, with the aid of Mr. Lincoln Ellsworth, he surmounted them in 1925. Two Dornier flying boats were acquired, in which six men ventured their all on a pioneer effort to fly from Spitsbergen to the Pole and back. Rather more than a hundred miles from the Pole they had to come down. Both planes were nipped repeatedly by the ice, one being abandoned. To build a runway through the walls of broken ice-rubble, which changed continually as the floes broke open and separated, required three weeks of almost incredible toil and undaunted effort; then, with six men in one machine, Amundsen reappeared at Spitsbergen. This was in 1925. In 1926, he and Ellsworth acquired the small airship *Norge*, in which they flew across the Pole from Spitsbergen, being beaten then by the rising star, Commander Byrd, by the narrow margin of three days. Byrd, who used a plane, flew back to Spitsbergen. Amundsen and Ellsworth went straight on to Alaska over a vast expanse of sea hitherto quite unknown, and

they had some considerable adventures before they came to earth at Nome, on the shore of Bering Sea. When he left Tromsøe on that fateful June morning, therefore, Amundsen knew full well the odds against him if he should crash.

One would think that the achievements we have mentioned were sufficient for one lifetime; but they form only half the story. Amundsen acquired a ship, the *Maud*, in which he had made the treacherous and exceedingly difficult voyage from Norway to the Pacific along the coasts of Russia and Siberia; a voyage made in its completeness only once before. Still more remarkable, he had once crossed the Atlantic in the tiniest cockleshell ever to brave a frozen sea, and with six companions had sailed through the North-West Passage. The British had sent many fine ships to the bottom, and had made an Odyssey of pluck and suffering, in a fifty years' effort to do the same thing, but without success. This exploit alone stamps Amundsen as an explorer of the first order. He was, besides, the only man who had ever made both the North-East and North-West Passages, and who had been to both Poles of the earth. Because the North-West Passage can be achieved, even to-day, only in the same way, we will recount the remarkable story, although it is forty years old.

When Amundsen returned from his first Antarctic voyage, and had obtained his master's certificate, he determined on what had been in his mind for a long time, to visit the region immortalized by the death of Franklin and the heroic efforts of many a stout

British seaman to ascertain his fate. There was a scientific background as well; for the North Magnetic Pole lies close to where the *Erebus* and *Terror* were sunk, on a peninsula of Canada near the north-western tip of Hudson Bay. Now the North Magnetic Pole is a region, not a point; at the Pole itself a magnetic needle dips vertically towards the earth's centre. Peculiarities about the inclination of the needle led to the idea that the Magnetic Pole moved, and in the words of one scientist, "behaved like a sort of wandering Jew". It was very important, for all navigational purposes, to fix the position of this pole as accurately as possible. It had not been done for seventy years, and Amundsen decided that he was the man to do it. He was very far-seeing, and he never left anything to chance that could be provided against. He went to Hamburg and studied the subject under one of its greatest masters. Then he got some funds together and bought his instruments. Then, and only then, he bought the *Gjoa*, a trial trip in which (in 1901) was anything but a picnic.

The *Gjoa* was a fishing boat, thirty years old. Amundsen stiffened her bows and stern with timber, to protect her against the ice; and he fitted her with an auxiliary petrol motor. She was rated at forty-seven tons. Her cabin measured six feet by nine. Yet in this vessel the hardy Norseman, with six companions, proposed to spend four years if necessary, working and navigating among the most dangerous and difficult seas on the globe; moreover, he proposed to load her sky-high with oil, with gun-



THE TRACK OF THE "GJOA"

powder, with the parts of huts, with stores, and with up to a couple of dozen dogs. He and his companions acted every part from scientist and commander to able seaman and cook. No wonder that scoffers said, before the adventure began, that the little ship would sink on the way to Greenland! But she did not sink. High courage, boldness, skill and luck carried her through one of the most remarkable voyages of our time.

Let us introduce the actors, mentioning first one who lost his life in the adventure. The second engineer, G. J. Wilk, acted as assistant meteorologist. Lieutenant Godfred Hansen, of the Danish Navy, was second in command, and in his spare time also navigator, astronomer, geologist, surgeon, photographer, electrician and explosives expert. Sergeant P. Ristvedt, the first engineer, acted as meteorologist, smith, clockmaker, and proved a first-rate sledger when the time came. A. Lund was first mate, Helmer Hansen second mate. A. H. Lindstrom the cook, had only just returned from Sverdrup's remarkable expedition to Ellesmere Island, where he had spent four years in the famous *Fram*; he too had a double duty, being zoologist and botanist whenever there was anything sufficiently alive for him to collect. The party took with them six of Sverdrup's Eskimo dogs, and had besides the advice and full assistance of Nansen.

They left Oslo at midnight on 16th June, 1903. As on the first voyage of the *Fram*, it was dirty weather, and the ship very nearly sank before Norway was out of sight; but she was a good sea

ship and fought her way out of it, although most of the crew were interested in anything but dinner. By 9th July they had made Cape Farewell. The wind was dead against them as they went up the west coast of Greenland, but at least it broke away the ice-floes, and the little ship struggled through to Godhavn, where to everyone's relief there was a holiday for five days while the instruments were tested. Then, more heavily laden than ever (for they now had eighteen savage Eskimo dogs chained on deck, besides additional supplies of oil and stores), the *Gjoa* stood off to the north-west, edging her way through the lane of land water close to Greenland, until she was brought up sharp by a solid line of pack in Melville Bay. Ahead lay fog, deep brooding grey mist, with ice everywhere; and beyond that ice they knew there were mountainous islands with cliffs running sheer into the sea, and between the islands channels filled with more ice, and beyond that more islands, all of which must be passed before they gained the mainland shore. The prospect was not good, but the job had to be done. After cruising along the ice-edge for two days, Amundsen spotted a crack and boldly drove the little *Gjoa* into it; a few yards, a crash or two as she shivered with the impact, and she was within the pack, free from the storms outside, but virtually imprisoned. The mist was so thick that they could see nothing, but whenever a crack opened they nosed their way into it; and now the advantage of having so small a ship became clear, for she could twist and turn in a way impossible to a larger vessel. Clear through the pack-ice they

went, until at last Lancaster Sound, its dark blue water stretching away into the fog, lay before them; through here they passed, hugging the cliffy northern shore, until they came to Beechey Island, a barren and dismal rock where a house, now in ruins, had been erected by the searchers for Franklin. The instruments were taken ashore, to test a theory that the Magnetic Pole had moved away to the north; they showed that this idea was false, so the *Gjoa* was turned south, towards the spot where Ross had fixed the Pole seventy years before. The channels were, as usual, choked with ice; but place after place where the Franklin relief parties had been stopped was now successfully negotiated, until at last Amundsen lay off the western coast of his objective, the barren peninsula of Boothia Felix. Fog still lay ahead of him, fog behind, fog everywhere, and although the sea was more open, it was so shallow as to make navigation perilous; moreover, the map was wrong, there were many islands which did not appear upon it, and the compass had, of course, now become useless. On 31st August the expected event happened, and they ran aground; luckily, there was no sea on at the time, and they got off again uninjured. Shortly afterwards came a more serious alarm, the cry of "Fire!" from below, followed almost immediately by a smell of burning and the first wreaths of smoke. Amundsen and his fellows rushed down to the engine-room, where Wilk was manfully trying to master a furious blaze. Up on deck lay seven thousand gallons of petrol, not to mention the gunpowder and explosives. Working

like mad, they got the hoses on to the fire, and soon the danger was over.

Next morning, while the captain was steering, he ran the ship aground three times in succession. Twice they got off, but the third time stuck fast. The wind was beginning to get up, the ship beat on the bottom dangerously, and every moment her commander feared that she would go to pieces. Dangerous passes demand heroic measures. The wind was now coming from the north, i.e. a little off shore; so full sail was crowded on, and after tossing there for thirty hours the gallant little ship floated off, but she left her false keel behind her. Amundsen afterwards confessed that he had never understood how she survived the shocks of that day. The very same evening came a new alarm. The wind, which is ever treacherous in these confined water channels, suddenly went round to the south and did its best to blow the ship ashore. She was headed to sea, both anchors out, and the engines driven full speed ahead; and even then the cables barely held. This gale lasted five days on end before the hard-trying *Gjoa* could get out to sea again; but that was the final trial. A few days later, having passed the very place where Franklin's vessels had sunk, the *Gjoa* was anchored off the squat, bleak island of King William Land, a low, sandy and desolate place, covered with moss, and about one hundred miles from the Magnetic Pole. This was an ideal position for Amundsen's work, because it is exceedingly difficult in practice to keep the compass needle perfectly vertical. A convenient cove, sheltered on three sides from drifting ice and

strong winds, was chosen for their winter quarters; they took the little ship into it, and, of course, named it Gjoa Haven. She was hauled up close to the shore. A rope was paid out from the masthead to the beach, over which supplies and provisions were landed. While some of the party erected huts and the observatories, and mounted the precious instruments, others went out with rifles in search of seals and reindeer. Both parties were most successful. The quarters were made snug and strong; and the carcasses of one hundred reindeer, piled up in heaps, gladdened the eyes of anyone who might fear scurvy during the coming winter. It should be noted that at this time Amundsen might have sailed along between the mainland and Victoria Land had he wished, and so completed the North-West Passage; but he let the opportunity pass, in order to complete his scientific work.

They stayed at Gjoa Haven for nearly two years. For nineteen months without a break a splendid magnetic record was kept, besides the usual weather observations. Outside the wind might bluster and howl, but within the huts it was always cheerful, if not over-warm. The spot was, in fact, among the coldest on the globe. On their first Christmas Day they had 72 degrees of frost. Either this severe cold, or some mysterious disease, attacked their dogs, all but seven of which died. Then Amundsen, who constitutionally irked at sitting still and doing nothing, tried a sledge journey towards the Magnetic Pole on 1st March; but, of course, it was still mid-winter, with a temperature showing 96 degrees of

frost. The snow was like sand, the sledges would not run, and despite all their efforts they covered only four miles on the first day. That night the thermometer dropped to minus 77 degrees Fahrenheit, or 109 degrees of frost, the coldest recorded at any time during the voyage. Next day, more back-breaking, swearing, shouting and pushing yielded a miserable three miles. After that, Amundsen gave it up and returned to the ship. When next he tried, it was April, and the weather, to these hard-bitten mariners, seemed intolerably warm!

They had not been at Gjoa Haven many weeks before they met their first Eskimos. A little doubtful about their reception—for the Eskimo of this quarter had not too good a reputation—Amundsen and two others, armed to the teeth, set out to meet them. They proved to be good, friendly people, tall, strong, and although inquisitive, not too difficult to handle. Later, about a hundred more of them were found, living in sixteen large snow huts. They and the explorers became the best of friends, exchanging visits and gifts; and these Eskimos were repeatedly allowed on board. On 20th November a family arrived, who reported having seen two large ships in Hudson Bay; one of these, the *Arctic*, which belonged to the Canadian Government, had previously been the German *Gauss*, and had done notable work in the wildest part of the Antarctic. Although she was 750 miles away, the Eskimo, whose name was Atagala, volunteered to carry mail to her; and six months later to the day, he returned with ten fine new dogs, which Amundsen stood much in need of.

He was rewarded with an old Mauser rifle and 400 cartridges—untold wealth to an Eskimo!

The other Eskimos were continually coming and going. Entirely dependent upon hunting and fishing, their movements were determined by reports of game, or by the appearance of seals. Throughout the summer they lived in tents, but during the winter in snow houses or igloos. They were unusually big people, the men being 5 feet 9 inches to 6 feet tall. When building their remarkable igloos, they selected the site with great care, choosing solid, compact snow, which was not too hard to cut into blocks. The upper layer of loose snow was first shovelled away round the site of the house; then, standing on the harder layer, the builder began to cut blocks out from it, which he piled up round him, thus building his house from the inside. It was built in a spiral of snow blocks, each set inwards a little until only a small hole remained at the apex; this was then deftly closed with a snow plug, and the sharp angles were trimmed off. Loose snow inside the house (which the excavation had now carried well below ground level) was banked up into a sleeping bench and a fireplace. The builder then cut his way out, while his wife entered and was walled in. The Eskimo squaw then tidied up the hut, stretched skins on the bench, and started the fire; while her spouse cut an underground tunnel nine to twelve feet long, into the new home. Two families commonly lived together in one hut, for the sake of warmth, and such a place would be barely ten feet across; but the Norsemen found some large com-

munal huts, all built of snow, yet twenty-five feet in diameter and fourteen feet high. If a window was needed (a luxury, of course!) a block of fresh-water ice provided some dim illumination; within the hut, however, the less that was seen the better, and in some of them the smell was almost intolerable. These Eskimos, though tractable and likeable folk, had their savage side. A boy of twelve accidentally shot a younger boy at the Eskimo settlement. The victim's father immediately seized the offender, who was his own adopted son, dragged him outside the tent, and stabbed him to death. Nobody interfered; it was the justice of the wild.

The first summer at Gjoa Haven proved a dreary time. Hunters went out, but game was scarce, and the onset of winter found only twenty carcasses in the larder. During the brief days of spring the shore was gay with buttercups and other brilliant northern flowers; among the mossy banks the cunning little white Arctic fox, the stoat, and the lemming had their homes. Water seeped into and over everything. Butterflies were numerous; gnats and myriads of flies tormented everyone, as they do the occupants of the whole vast stretch of the Barren Lands of Canada. Eskimos provided some excitement, by bringing aboard blubber and sealskins, in exchange for timber and iron, together with a few knives and tools. Then the flowers died, the cheerful, grinning visitors departed, the wind moaned down into the little bay, ice formed around the ship once more, and the geese and other northern birds betook themselves elsewhere. Snow, mist and winter darkness lay

over everything; but within their huts the seven adventurers quietly and calmly continued their work, quite ignorant of the idea (so common in England at that time) that under such conditions men become insane.

Again spring arrived, and again the restless Amundsen was on the move. The main journey now, however, was made by Lieutenant Hansen and Ristvedt, who with sledges and dogs left the ship on 2nd April for the north-west. Beyond a small knot of islands lay the large island called Victoria Land, much of the coast of which was still unmapped. These two men, with a couple of sledges and twelve dogs, followed it, marking out their route, until their stretch of mapped coast tied up with the last points that the British had definitely fixed many years before. They outran their provisions, but by shooting bears, seals and reindeer, managed pretty well on the whole, and after an excellent piece of work regained the Haven, having been away nearly three months. A few days later (1st June), Amundsen gave orders to dismantle the observatory and pack up the instruments. They had to wait some weeks before the ship could be freed; and when eventually they left King William Land (13th August), their friends the Eskimos were genuinely sorry to see the last of them. One boy, indeed, decided to go with them, but after making the North-West Passage in the *Gjoa* he was accidentally drowned, not far from the Alaska boundary.

Now came the crisis of the *Gjoa's* voyage, a fortnight of twisting and worming her way through the

ice-filled and very shallow strait between Victoria Land and the continent. To-day its peculiarities are well known, and during the summer one or more small Government steamers make the voyage annually to King William Land. They stop at half a dozen places where some lonely hunter has his house; they take supplies to the Eskimo camps, and not infrequently a Canadian "Mounty" is on board. But at the time of which we are speaking, the channel was desolate and deserted; only where it opened out into the wider sea near Banks Land did the Norsemen at last meet with a ship. It was 28th August; for the first and only time in history, the North-West Passage had been sailed through in a ship.

The adventures of the *Gjoa*, however, were not yet over. The Canadian Arctic shore-water is excessively shallow, ice often lying upon it, aground, throughout the year. At King Point, near to the Alaska boundary, this ice, which came in from the solidly massed floes that filled the Beaufort Sea, barred all farther progress; and a few days later the little ship was frozen in for the third time. Between them and the coast lay a wreck, the *Bonanza*; she was a whaler which had been crushed in the ice. The *Gjoa* escaped that fate, although her position was decidedly dangerous. Amundsen went ashore, where he found great masses of drift-wood, trunks and branches of trees which had come many hundreds of miles from Siberia. Out of this timber a house was built, and the observatories were then set up again. Meanwhile, he himself, impatient at the

unexpected delay, went on to Barrow, the most northerly settlement in Alaska, in order to deliver the expedition's mail and to learn the news. He was away nearly five months. When he returned, everything seemed in good order; but Wilk, the second engineer, had borne the privations of the winter less easily than his fellows. A few days later he took to his bed, and on 26th March he died. The ground was so hard that his comrades could not even dig a grave for him until 9th May; and in the meantime, they placed his coffin in their dwelling house on the shore, which was nailed up securely and abandoned. As soon as it was possible, they buried poor Wilk, erected a large cross where it could be perceived from the sea, and left some flowers above his grave.

July had come before the ship broke free from her icy cradle. A lane of open water ran between the frozen ocean—a vast expanse of white which in this region stretched many hundreds of miles across the North Pole and so to Spitsbergen—and the barren, flat shore of the Alaskan tundra; but in this strip of open water floes surged aimlessly to and fro, any one of them sufficient to deal the little ship a deadly blow. She was therefore worked under the lee of the wreck, so as to gain shelter until more ice had melted. On 11th July the watch shouted below, "Ships ahoy!" The crew rushed on deck, to find a couple of American whalers approaching; they had come in to collect driftwood. Where they could come in the *Gjoa* could go out, argued Amundsen. Sail was hoisted, and that evening she stood out to sea; they had not got very far, however, before they were

halted again off the low, marshy Herschel Island, and here the ice held them prisoner for a whole month. Freed once more, they passed Barrow and Icy Cape, worked their tortuous way into Bering Strait, and on 31st August reached Nome, a little mining town on the Pacific coast of Alaska. Here the American colony gave the hardy adventurers a true northern welcome. Five days afterwards the stout little ship went under her own steam to San Francisco, and so completed one of the most remarkable voyages ever made.

Yes, it was not inapt that Amundsen should meet his doom in the sea where he had fought and dared and suffered, and had won so much fame. It was a fitting end for a true Viking.

CHAPTER VII

The Empty Quarter

This is the story of how one Briton, by combining persistence, boldness and tact, overcame the age-old prejudices and dislikes of fanatical Arabs, by making some of them accompany him in a most venturesome journey across the last large unexplored part of the globe. The hero of our story, Mr. Bertram Thomas, O.B.E., had for some years been upon the staff of the Sultan of Muscat, a tiny state the white-washed buildings of which look out upon the glaring desert on one side and the deep blue water off the

Persian Gulf on the other. The scene of his exploit was the country immediately behind Muscat, although he was forbidden to approach it directly. Six times the size of England, it was utterly unknown, even to many of the Arabs, who indeed, although bold raiders and wanderers themselves, enduring hunger and thirst through many a mile of waterless sands, yet knew so little about this region that they called it Rub' al Khali, the Empty Quarter.

You can see the south-eastern part of Arabia on the map, jutting out boldly into the Indian Ocean; Muscat is near its tip. Only the fringe of this land was known, a strip five to ten miles wide between the heavy ocean breakers and the dark green mountain wall, several thousand feet high, which everywhere frowns down upon the sea. For an unbeliever to venture ashore, there where the Moslems were the most fanatical and strict of all their race, was an act bordering upon folly, a knife-thrust or a shot in the back its probable consequence; but twice within a century Englishmen had been there, once even to the mountain crest. There were trees, pastures, sheep, forests, things we little associate in our minds with desert Arabia; but this of course was only on the seaward side, where the winter monsoon provided much life-giving rain. Nobody knew what existed inland, although it was believed that like a huge sloping table-top the country inclined downwards into the heart of the arid desert, the water-courses running out into dry stony wadis, with never a tree or a shrub, and perhaps without any living thing. Of course, in 1931, when the famous journey

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was made, one could have flown over the Empty Quarter readily enough, say to Basra or some other Persian Gulf town; but that would have conveyed absolutely nothing of Arabia, which can only be examined properly from the back of a camel. As we shall see later in this book, motor cars with caterpillar tracks have proved invaluable in some deserts, but the soft fine dunes of south-eastern Arabia rise as high as St. Paul's Cathedral, in places even higher, and it was tolerably certain beforehand that even if one could drive a car through the home of the wild Bedawin tribes in safety, one would only be drifted up in the sands. Besides, Mr. Thomas genuinely loved Arabia and its people. Their beast of burden was his beast of burden, their ways were to be his ways; so he went by camel. His design was to pass round the tip of the peninsula by water, land at Salala, about half-way down to Aden, and then cut diagonally across the mountain wall and the desert back to Muscat. He was very soon made to learn that things did not work out like that.

You must understand that he had very special qualifications for his delicate task. As the Wazir of the Sultan, he had sat in justice upon Arabs, and he knew them and their language thoroughly. He wore an Arab gown, grew a beard, and gave up smoking, because the Arabs regarded smoking as a vice. He was even prepared to live like them, sleeping in the open, although the nights are bitterly cold, however hot the day may have been. He was tall, strong, athletic, and patient, all qualities which Arabs admire. Nevertheless, no sooner had he mentioned

Exploration To-day

his proposal at the little court, even obliquely, than the usual crop of obstacles sprang up. Nobody but a maniac or a robber ever went into the desert. The border tribes were always at war with each other; and if any particular tribe did not kill him for an unbeliever, some other one would certainly do so. There were no wells for days on end. Even if there were wells, why should Arabs disclose their positions to a foreigner, who one day might seize them for his own people? Finally (and this argument was always the most important in the end), camels were expensive and rare; the Arab lived by them, prized them more dearly than his own comfort, and could not be expected to venture such valuable beasts in a senseless piece of exploration. Mr. Thomas listened to all this, and then went just the same; first, however, he had to make a trial journey round the fringe of the Empty Quarter, partly to show that he could be trusted; but it was made clear to him that even in this trip no responsibility should attach to Muscat if he perished.

On 28th December, 1927, he left the little town by sea, landing again not long afterwards at the fishing village of Suwaih, near the tip of the peninsula; this was the home of the Wahhabi, strictest of all Arab tribes, but it came within the Sultan's sphere of influence. Escorted by forty picturesque and dirty men, almost literally the "forty thieves", Thomas rode inland, up a dry and stony water-course, past occasional low acacia bushes, in order to make friends with the Amir of Bani Bu'Ali, whose town no European had entered for ninety-



SOUTH-EAST ARABIA
Showing routes of Bertram Thomas, 1928-1934

three years. The watercourse led up among the hills, where there began a grove of date palms on either side; and amid these palms the Amir's white-washed fort was placed, much like the setting of a Hollywood film. Armed riders on curveting and spirited horses came out to meet the stranger. A feast was held in his honour. The Arabs, who were wonderful horsemen, drove their steeds into a gallop and then stood barefoot on their backs, supporting themselves by gripping the saddle with their toes alone. Of course, at the outset Mr. Thomas said nothing about his business, which was to procure transport for a journey through the coastlands to the Frankincense Country; the haggling was to come later. For the present, he merely stood and watched the departure of a crowd of raiders who were on murder bent; they were accompanied by their womenfolk, who carried the powder and the water-skins.

After a week's delay matters were arranged. A party would take him one-third of the way only, after which he must fend for himself. He had to exercise the strictest care and even then sometimes got into trouble; but his position as the Sultan's representative always helped him through. When the first escort left him, another week was spent in arguing over the collection of a second; and similarly with the third. It is the custom, when passing from the country of one tribe to the next, to be escorted by a sort of ambassador or Rafiq, who belongs to that tribe, and by his mere presence answers for the bona fides of those with him. The

third of Thomas's guides, one Luwaiti, saved the Christian's life during a rather dramatic incident. They had gone inland, where rich meadows, and patches of trees made up a charming landscape, and were ahead of the main party, when Thomas urged his beast into a trot. Now suspicious eyes may always be watching a caravan on the march in Arabia, and if it hurries the presumption is that raiders are coming. The first hint that our traveller got of this, however, was when bullets began to whistle about his ears. Luwaiti then rushed forward, unwound his turban, shouted to the Englishman to stop, and himself went on towards the bushes, waving the cloth in the air. The signal was understood, for the firing party was of his own tribe. Six of them came back with him, and peace was restored. Mr. Thomas was particularly careful after that not to let his animal spirits get the better of him again!

At last they came down into Salala, the port of Darfur, a place with a wide street of flat-topped houses two or three stories high, with groves of date-palms, running water, and a formidable square fort where the Governor lived. Here his first journey ended. He had been round the Empty Quarter, a journey without precedent; the next step was to get into it.

He made the attempt in January, 1930. Prospects looked favourable, for the Sultan himself accompanied him by sea to Salala, and he hoped that a plausible story about going home overland might get him through; but the utmost he could achieve was to build up a caravan which would take

him over the escarpment to the hidden land beyond, and perhaps for a few stages along the fringe of the desert. With mental reservations he agreed, and eventually set out accompanied by twenty-eight mounted Arabs, nine baggage camels, and his two servants. As we have said, Thomas lived entirely like the rest, his only "peculiarity" being that he insisted upon camping at some distance from the fire each night, and ordering that during his rest he should not be disturbed. By this means he was able to unpack his instruments (the sight of which would probably have wrecked the enterprise) and take observations of the stars from behind a screen of cases. Some things, however, he had to display, such as his watches; the desert Bedawin had never seen such things and they took a childish delight in listening to the watch's ticking. For the rest, they were strongly built, dirty vagabonds, clad in greasy rags, devoted followers of the Prophet, thieves of any other man's property, but quite loyal to each other. They were all equal and would accept no leader, but naturally one who knew the water-holes had a strong influence over the rest. When on the march, they would suddenly burst out into some such ejaculation as "God is All-powerful!" or if any misfortune befell them, "It is the will of Allah!" Whatever the urgency, if camel-feed should appear, the caravan would stop; at other times it went on, hour after hour, until the Englishman felt almost ready to drop; the camels and the water-supply conditioned everything. The Arabs lived almost entirely on camel's milk, and Thomas had little

more. When darkness fell, and the stars were blazing in the deep blue sky, and the pungent smoke from the fire was curling up to heaven, they would tell stories against one another, such stories as the "Arabian Nights' Entertainment" is made of. It was a strange life, not easily to be forgotten.

The ascent to the escarpment took them up a gorge filled with large trees—trees in Arabia!—and places where water tinkled cheerfully as it fell from rock to rock. Over the top, and they were in country hitherto unknown to any European; fortunately the mountain tribes, who pasture cattle and goats here in large numbers, were at peace, so that there were no "incidents". A rich grassland lay before the traveller's eyes. Only a little way farther, however, and the breath of the desert reached up to it. The land sloped downwards to the interior, being cut up by a number of watercourses, all more or less parallel. Near the summit, where there is moisture, the far-famed frankincense trees grew; unpicturesque collections of stems, some ten feet or so high, springing from a common trunk almost at ground level. They are bled, like rubber trees, a notch being cut in the bark, through which the gum slowly runs, hardening and increasing until it is a large lozenge-like mass; it is then collected. After being bled in this way for five months, the tree is left to recover for a year or two before being tapped again.

The upper parts of the river-ways or wadis contained water, usually in pools, the haunt of flies and other pests; farther down, however, could be seen nothing but the dry bed of the wadi, with the cliffs

that held up the water and formed the banks during some remote age when the climate was moister. Water still drained underground, however, as was shown by the numerous acacia trees. Eventually, the last trees fell behind, or were seen to be mere dried husks; the banks of the wadi became lower and lower, and the whole surface was overspread by stones and gravel, until nothing could be seen but a desolate sloping, stony plain. At the bottom, all these wadis ran into one master streamway, which itself was waterless; this was called the Wadi Um 'al Hait, and lower down the Wadi Mugshin. They followed its bed, such routes being the natural ones in this roadless country. On their right hand were the mouths of the incoming tributaries—a river-system without any water!—and on their left lay the edge of the Sands, a mountainous line of huge red dunes, each 300 to 400 feet high. While here the spirits had to be propitiated. At every camp a little of the first water to be boiled and the first food to be cooked had to be ceremoniously thrown on the fire, and a little thrown away, so as to humour the fire and the local spirits for permitting the caravan to camp there.

Mr. Thomas was a keen observer, but he found very little to collect. Ugly lizards watched them motionless from the rocks, darting away when the intruders came too close. Near water there were insects and other creeping things, besides a few birds, but elsewhere nothing but the bare desert, a hot plate by day and a lifeless world by night. The Arabs are of many tribes and various origins. He

induced some of them to have their heads measured and their photographs taken, but this was always a risky experiment, which might easily end in the destruction of his "black magic" camera. From a cave in the mountains he unearthed a skull, which was secretly packed up and taken along. His servant, who had observed this strange proceeding, told him next morning that he had found another—hoping, of course, for a reward. On being questioned, it turned out that the skull was his own father's!

The empty river bed which they had been following ran down towards Muscat, and the appearance of bushes in it betrayed the fact that the water underground was now more abundant. At last water-holes appeared, and then what to the men's jaded eyes seemed an Arabian paradise, a couple of lakes, each a few hundred feet long, surrounded by groves of date palms. This was the Wadi Mugshin. The lakes were simply called Al 'Ain. It required some persistence before the Arabs could be induced to leave it. At length a few of them agreed to accompany him for a short distance into the sands, and that was as far as he got on this occasion into the Empty Quarter.

For his third and finally successful journey he employed guile. He simply disappeared from Muscat on leave, without saying where he was going. On 6th October, 1930, he embarked on a small sailing boat and directed her skipper to an agreed rendezvous, where a passing British tanker had arranged to pick him up. This ship took him as near as possible to Salala; he then trans-shipped to an Arab

dhow and was landed through the heavy surf upon an open beach not far from the town. Of course he had to go boldly into Salala and to stay at the Governor's fort, but he allowed it to be known that he was bent on a winter hunting trip in the mountains. Secretly, he had arranged during his previous visit for one of the Rashidi Arabs—the tribe which frequented the red sandhills inland—to procure a caravan, on promise of a rich reward; but now, alas, neither Arab nor caravan was to be found. To make matters worse, a tribal war had broken out in the mountains, and none but a well-armed party could venture thither. Mr. Thomas, however, became only more determined the worse things looked. He sought out two more Rashidis, and by promising each of them a camel—the most potent of all bribes—induced them to venture across the mountains in search of men and beasts; for it was certain that none but desert-bred camels could survive such a journey as he had in mind. While the men were gone he prudently withdrew himself to the hills, hunting and collecting in the forest. He returned to Salala, only to find that a ship was coming into the harbour, the captain of which expected to take him back to Muscat; and the two Arabs were still missing! He had almost decided to abandon the adventure, when at last they arrived, having obtained a promise of thirty men and forty camels, under the leadership of a trustworthy old sheikh, Salih bin Kalut, whom they brought with them. To the sheikh Thomas disclosed the object of his journey, which was to return to Muscat across the Empty

Quarter. The sheikh demurred, but after a few days agreed to take him to the mountainous Red Sands, behind which lay a well-known oasis called Khor Dahiya. Fortunately, rain had fallen of late, so that there was a possibility of collecting sufficient Arabs of another tribe there to take him into the heart of the Empty Quarter; what was to happen thereafter, Allah must decide. Mr. Thomas took the chance, dismissed the ship back to Muscat, and himself joined the caravan in the hills. He found his men to be an even wilder and more nondescript-looking lot than his last party; but there were no others to be had. They were clad in rags, had masses of touselled brown hair, with no other protection from the fierce sun, went barefoot everywhere, and were as hard as the proverbial nails; but they served him well. They carried rations for twenty days, the time needed to reach Khor Dahiya; but their white companion loaded his baggage camels with dates, fruit, butter and rice, sufficient for six weeks. He again dispensed with a tent, living in the open like the rest.

Whether the strength of the party (which was continually being reinforced by men who desired to get through the dangerous country, and who came and went as they saw fit) discouraged any attempt to attack it is not clear; but they passed without incident through the troubled zone, and across the Frankincense Country into the waterless wadis we have mentioned earlier, until they reached a desolate little waterhole called Shisur. Sheikh Salih had gone on ahead to arrange about the second caravan, but

the Englishman had no difficulty with his people; nor was there really any room for trouble—they simply had to keep together, and to keep on, if they wished to end the adventure alive. Dropping to the edge of the Red Sands, they now turned west—i.e. with the Wadi Mugshin and Muscat behind them. On their right hand, and presently overstepping the track, lay a mighty line of red dunes, each as high as St. Paul's Cathedral, with hollows between them encrusted with bitter white gypsum. Presently the line of camels was enveloped by these dunes, until it seemed to have been swallowed up in a vast, silent rolling red ocean that had suddenly solidified; and from the great walls beside them intense heat radiated during the day. Now and again—not more often than absolutely essential, of course—it was necessary to go over a dune, the sand being so soft that everybody had to dismount and scoop out hollows in it before the camels could pass. Here for the first time Mr. Thomas heard the singing sands, a weird noise, like the shriek of a ship's siren, which is made by a dune when the sand is disturbed. It would start quite suddenly, continue shrilly for a couple of minutes, and then die away again. Christmas Day found the caravan entirely surrounded by mountains of sand. For nine days now they had had no water beyond the precious portion which they carried in their goat-skins. The camels were almost completely exhausted, their riders parched and weary; but they had to go on. This night they halted upon the crest of a dune 300 feet high. At dawn two men quietly went ahead to examine the



HALT FOR PRAYER, CENTRAL SANDS, SANAM, ARABIA

By Permission of Bertram Thomas

water-hole, a very necessary precaution, because if an enemy was in possession the caravan might be wiped out as it straggled in. All was well. The men returned, to report that their Rashidi comrade had been to the well, as had one of the Murra tribe, who were to be Mr. Thomas's next escorts; but they had seen nobody. These people showed all the ingenuity of a Sherlock Holmes in picking up clues; the shape of a man's feet, the way he walked, the gait of his camel, and whether the depth of the impressions indicated that it was loaded or not, all these and a score of other minute details the "ignorant" desert Bedawin learned to recognize automatically. To them a footprint in the sand might mean help, a friend, or a dangerous raiding foe, and they were uncannily skilful at interpreting such signs. For the same reason, when in enemy country, they habitually tried to cover up their own tracks at night, lest their foes should follow them into camp and slaughter them while they slept.

Sheikh Salih now turned out to be a real friend to the explorer. Not only had he got twenty Murra tribesmen together, but he had also engaged one Hamad bin Hadi, who knew the desert well, to act as guide. Hamad had a feud with the Sa'ar tribe, some of whom he himself had killed. He was therefore not unnaturally nervous of strangers, and during the journey more than once compelled the caravan to halt while he crawled on ahead to reconnoitre some suspicious object, only to find that it was a mirage or a dead bush. Nevertheless, such was his acquaintance with the few wells, and the scant pas-

turage, that without him, says Mr. Thomas, it would have been impossible to move a mile.

The new men were even wilder than the old. Riding carelessly on their hardy camels, either astride or squatting as the fancy took them, they carried their rifles across the animal's back, and would slip down to pick up some object off the ground, and mount again, with the agility of cats. Like the others, they lived on camels' milk almost alone; so did their white leader, except for a few trifles of tinned food now and again. For fifty-eight days he never had a full meal, and he lost twenty-one pounds in weight. Each morning the call to prayer roused him, along with the rest. The camels were caught, pastured, and loaded, the scanty breakfast swallowed, and then for ten or eleven hours on end they marched through the pitiless heat. Although the course was generally northwards towards the Persian Gulf, it diverged wherever pasture appeared; for without pasture the camels could not be kept alive, and without the camels disaster would be certain. Sometimes the men merrily hummed a tune, sometimes they broke out in invocations to God; and in the midst of them all Wazir Thomas, his helmet concealed beneath a turban and his sextant beneath a box lid, marched and suffered uncomplainingly with the rest, keeping his inward emotions to himself. Apart from differences in the relief of the sand dunes they found nothing; the Empty Quarter really was empty after all.

At Shanna, a water-hole in the very middle of the desert, they again met the old sheikh, who had

collected a third party of thirteen Bedawin and five pack animals. The Qatar Peninsula on the Persian Gulf was 300 miles to the north, Salala and the ocean nearly as far away to the south. There still remained twenty-five days' rations, with which the venture must be made. Thomas took over the new party, and all pressed on, everyone knowing that any delay or accident would be fatal. They passed through a district called the Region of Sand Ridges, where lines of dunes 80 to 100 feet high ran transversely across the route, and between these were floors of hard red sand. All the time the country was sinking towards the Persian Gulf, until at last it descended below sea level; and here there occurred a salt lake, rimmed with lines of solid white salt and—a curious fact—a line of dead locusts. Once in the sands a fennec fox was caught, but life of any kind was rare there, and even that bird of ill omen, the raven, for the most part kept to the desert wadis and the pools. The travellers also found a couple of eagle's eggs, which Thomas believed to belong to the Abyssinian Tawny Eagle; but the living bird was not seen.

The water, though not scarce, now became worse and worse. It was thick like beer, smelt strongly of sulphur, and tasted bitter. Both men and animals were suffering from the effects of it, and Thomas himself would not touch it except when absolutely compelled to by thirst. They therefore turned away to the north-west (although that was inhabited country, where their reception would probably be unfavourable) in order to take advantage of the sweeter water; but here the wells were anything up

to one hundred feet deep, and anyone who ventured into the hole to clear it out stood an excellent chance of being buried alive beneath an avalanche of loose sand. Their prospects were not improved by a fierce and persistent gale, which now swept over the desert for six days incessantly. It picked up the sand, driving it like fine hail into eyes, ears, noses and down the men's parched throats; yet it was imperative to struggle on. At night, the temperature dropped until it was bitterly cold—one night, in fact, the thermometer recorded thirty-five degrees Fahrenheit; but owing to the wind and storm it was impossible to keep a fire alight. If a brushwood screen had not been built around the shivering camels some of them would probably have perished. Then, after eighteen days' toil, the sky cleared, the wind died away, the warm sun reappeared, and the much-tried party took a day's rest. They had reached Banaiyan, a stone well, and the worst of their task was over.

It remained to get to the Persian Gulf at the little town of Doha, without being seen by the fanatical Ikhwan tribe, a journey of more than 100 miles, through salt-crusted desert steppes, varied by patches of gravel in which brilliant red, white, green and black pebbles were conspicuous; occasionally dune-belts had to be crossed, but these were easy after the Rub' al Khali. In order to avoid detection, Thomas marched by night and rested by day. Once he and his men saw a herd of black cattle in the distance, but they met no men; probably most of the tribespeople were away, celebrating the festival of Rama-

dhan with their relatives. When at last the coast was near it began to rain; this turned the surface into a greasy mess, the Arabs being compelled to dismount and lead their animals carefully over the worst places; for if a camel slips he may get the splits and be fatally injured. This last obstacle surmounted, they saw the blue sea from a hill-top, and three days later (5th February, 1931), marched into the street of Doha. The Empty Quarter was conquered at last.

Among the congratulations which Mr. Bertram Thomas received on this exploit none was heartier, or was valued more, than that of his old friend, Mr. H. St. John Philby, "Abdullah Philby", as the Arabs called him. Philby, who knew the desert even better than Thomas, was attached to the court of king Ib'n Saud at Riyadh. He had long contemplated tackling the Empty Quarter himself, and had eventually induced the king to send a strong party thither, with the Englishman as observer. They were about to start at the very time when Thomas was entering the desert on the other side. They made their journey—and a very remarkable journey it was, since it carried them right across Arabia to Mecca—a few weeks later, zigzagging across the Empty Quarter sufficiently to disclose most of its remaining secrets. But, of course, Mr. Thomas had blazed the trail, if indeed anyone can blaze a trail where there is no wood and no track!

CHAPTER VIII

After Whales in the Antarctic

Shortly before the war, Londoners often stopped to look at an old wooden sailing ship, with auxiliary steam, which was moored in the Thames off Hungerford Bridge. As a rule, she seemed to be deserted. When viewed from the bridge above, she had a square and ungainly appearance, and she was, in fact, a rather ungainly sailor, but the sight of her name aroused a thrill, for this was the famous *Discovery*, in which Captain Scott made his first journey to the Antarctic in 1902, the very same ship that he had run aground at the moment when he imagined his troubles to be over. Now she had nothing to do, was a mere show ship, and yet only a few years before she had buried her nose in worse seas, and her rigging had whistled to more furious gales, than in the days of her first glory.

The story is a curious one. The *Discovery* was specially built in 1901, one of the last examples of a large wooden British ship. After the Antarctic voyage the government could find no further use for her, so they sold her to the Hudson Bay Company for £5000. After nearly twenty years' service in northern waters, it was found that the government needed a ship to carry out research work in the Antarctic; so they thought once more of the old *Discovery*, bought her back for £11,000 (!), took her

to Portsmouth Dockyard and had her largely rebuilt. She had never been well suited for such a cruise, and this was still the case; but it made no difference. On 13th June, 1925, she was recommissioned, in the presence of admirals, scientists, reporters and a few of the public. She was to voyage to the Falkland Islands Dependencies and to spend five years there, crossing and recrossing the stormiest seas in the world, where the winds blow one way only, and despite the fact that she rolled worse than a drunken sailor, and that her coal capacity was exceedingly limited. The duty of those on board the *Discovery* was to track down whales, to mark the monsters with discs so that if caught later some idea might be gained of their wanderings, to study the waters in which whales lived, and the food they ate, and, in a word, the whole life-history of the giant mammals from babyhood to old age. Finally, when it was at last appreciated that the old *Discovery*, even though assisted by a modern steamship, the *R.S.S. William Scoresby*, was hardly equal to this protracted task, they brought her home and replaced her by *R.S.S. Discovery II*. The *Discovery* went once more to the Antarctic, however, under Sir Douglas Mawson in 1930, as we shall see below.

You may wonder where the Falkland Islands Dependencies lie. Not many people have ever heard of them. They are a lonely collection of several island groups, mostly mountainous, which rise out of the Southern Ocean to the south and south-east of Cape Horn. First, the Falkland Islands themselves, which have settlers and a Governor; then,

hundreds of miles to the east, South Georgia, with a shape like a half-eaten bone, an ice-covered mountain core that is practically unknown, and one important oil refinery at Grytviken; here, at the gate of the Antarctic, Sir Ernest Shackleton lies buried. Then, hundreds of miles south-east of South Georgia, come the South Aucklands, and hundreds of miles beyond that is the mysterious and rarely seen Bouvet Island. Far to the south are the South Sandwich group, and then, around the huge mountains and brilliant white glaciers of Graham Land, the Palmer Archipelago. Not one of these many spots contains a permanent human habitation, although the still steaming and half-drowned volcano of Deception Island has afforded a haven to many a battered whaler. But upon those barren beaches seals, sea lions and the rarer and huge sea elephants love to climb, and in the deeper waters around them whales once sported and dived, fought with the savage, yellow-throated killer whale, and dying at last, sank unheeded to the bottom, in their thousands. At the beginning of this century, when the *Discovery* was building, and when to meet a whale in the northern seas had become a rarity, a few enterprising seamen who had gone south found literally thousands of these huge animals. They were finner and hump-backed whales and the huge blue rorqual, all unlike the creatures which are still caught off Iceland or Greenland, but equally important (if caught in sufficient numbers) for their yield of oil. The valuable sperm whale, true lord of the ocean, also condescended at times to go south. Here was a vast un-

tapped field of wealth. The Scottish and Norwegian whaling industries saw its possibilities, and both exploited them unmercifully. Despite an international agreement to control the "fishery" (which was done under licence), a regular massacre of the huge but to man helpless creatures set in; twelve thousand were slaughtered in a single year. The Norwegians, in particular, organized a regular campaign against them. They sent out large floating factories, powerful steel ships of 7000 tons, rising eventually to the 20,000-ton *Cosmos*, which could tackle ice-floes almost as well as an ice-breaker, and which had on board all the apparatus for taking up the captured whales and turning their blubber into oil. At first there was only one such ship, but eventually there were several. Attached to each floating factory was a string of small whalers, the ships that did the actual hunting. At first the industry prospered exceedingly. Whales, however, breed very slowly, and require many years before they arrive at maturity. Under the ruthless assault of man their numbers dwindled. In seas which once had abounded in them, not enough were now found to justify the cost of the voyage. The Norwegians were compelled to go farther afield and to seek new hunting grounds; and in doing so, thanks to the enterprise of a few scientists, they advanced man's knowledge of the Antarctic as well. What the whales thought about all this we can guess; what the British government thought, is shown by their having equipped the *Discovery*, in order to find out how and where whales live and breed, so that the

fishery might be better controlled before it became too late.

Dr. Stanley Kemp had charge of the expedition, the *Discovery* being under Commander Stenhouse, D.S.O. The scientific staff included Messrs. A. C. Hardy, Hamilton, Gunther and Herdman; and they had many duties. The ship was intended to travel on fixed lines along and across the main currents of the Southern Ocean. At regular intervals she would stop, pick up time signals with her powerful wireless, and establish her position. A number of deep-sea lines would then be paid out, down to depths of more than a mile, and at fixed points on these lines water-bottles and townets were fastened, the interval being only ten yards between each pair near the surface, but up to 250 yards or more in the depths. You must understand that however clear and empty sea water may seem, it abounds in minute, glassy and transparent things. Some of them look like the extraordinary creatures which Mr. H. G. Wells pictured as inhabiting the moon, being all heads, eyes and legs. There are larval shrimps, larval lobsters and crabs, pin-like larval herrings and many other young fish, all kicking, biting and eating, in countless myriads; but of course they are all very tiny. Then there are full-grown shrimp-like animals, up to a quarter of an inch long. Some of these are called Copepods or Oar-feet; they are the main food of herrings, which follow them about; and herrings are followed by the mackerel which eat *them*, and the mackerel in turn afford many a meal to dogfish and sharks.

Thus, you see, where the tiny Oar-foot (which is practically at the mercy of the current) chances to go, all the others follow it. Now the Oar-foot lives on minute marine plants, which spring up in myriads at one season and then die off until the next; and so we get more fish or fewer, according to the food supply. So it is with whales. Those giant creatures live on an animal no larger than one's finger-nail, very much like a shrimp, called Krill. The whale opens his tremendous mouth, snaps up a few thousands of the Krill at one bite, and then, by forcing the water out through his whale-bone filter, obtains a tasty dish. (Only sperm whales have teeth, these monsters having frequently been seen to toss a powerful shark into the air, catch it dexterously as it descends, and then with a single snap of the jaws bite it in half.) The men on the *Discovery* therefore were really looking, not for whales, but for Krill, and for the minute plants on which Krill live. Their ultimate object was to map out the sea, with the currents showing the directions in which this stream of minute life drifted, for there assuredly the whales would follow it. Now what lives at the surface is quite different from what lives a few fathoms down; and in the depths are hosts of marine animals which remain all their lives between the top and the bottom; on the other hand, some kinds come up and others descend periodically, being influenced perhaps by the light conditions and the saltiness of the sea. It is all very complicated indeed; and in order to disentangle it, one must observe *at one time* as many different levels as possible; hence the water bottles

and townets, which by a self-closing device could be shut before being hauled to the surface. Protracted hauls were also made with small trawls. You can imagine what work this meant for the scientists. Everything had to be labelled and bottled, if it was large enough; while the thousands of minute things were studied and roughly named beneath the microscope, samples being taken of the rest for examination ashore. The vast majority are not only glassy and full of water, but very difficult to preserve; and of course all the work had to be done on a ship which was constantly heeling over to the wind; and if the captain suddenly changed her course, in order the better to ride the mighty billows, anything that was not screwed to the floor went sliding madly across the cabin. To add to their labours Mr. Hardy invented an ingenious means of recording a continuous strip of the life over which the ship sailed. A long muslin ribbon, wound on spools, was submerged and towed like a paravane; by the operation of a small propeller it was continually wound on a second spool, so that every part of it might pick up some tiny gelatinous things. To examine this ribbon and nothing else was a full-time job for one man on shore, let alone on the decidedly lively *Discovery*.

The story of the actual voyage will not interest you very much, because the daily routine was never varied, except under stress of weather. They left Falmouth on 5th October, 1925, and towards the end of 1927 returned home, after spending some time in company with the much more powerful steamer, *R.S.S. William Scoresby*. In these two years

the *Discovery* went to Capetown, thence to South Georgia and the edge of the pack ice; thence to Capetown again (where special keels were fitted to her with the aim—only partially successful—of reducing her rolling); then back to South Georgia, to Graham Land, to the magnificent mountainous islets of the Palmer Archipelago, to the beech forests by Cape Horn, and at last back to Capetown once more. Every day, when it was practicable, they halted the ship, paid out their lines, towed them a little, hauled up the contents, and then sailed on. They started with a hurricane, and fierce gales followed them throughout. They went right up to the edge of the mist-covered, but loose and waterlogged ice-pack that surrounds so much of Antarctica; once a gale drove them right into it, and they were forced to use some of their precious store of coal before they could get out. They counted bergs of every size and description, from magnificent tabular sheets, like floating islands, flat-topped, high, with deep blue caves where pieces had fallen away, down to needles that rose high in the air, the bottoms being stranded offshore. One hundred and ninety-two icebergs were once encountered in a single day; and on another, when they were steaming in the teeth of a gale, and treacherous mist lay heavily about them, more than sixty big bergs were seen, any of which could easily have wrecked the ship. That she went so far, and did so much, without accident, speaks volumes for her master.

Perhaps the most interesting place which the *Discovery* visited was Deception Island, which lies,

with other islands, a little way off the high and finger-like mountain mass of Graham Land. Earlier they had passed Elephant Island, a miserable rock where many of the survivors of Shackleton's *Endurance* had wintered ten years before, while their leader made a wonderful boat journey to South Georgia in search of help. As the ship approached Deception, she found herself opposite a narrow gap in what looked like a sugarloaf peak rising from the sea. She was steered close under the northern side where cliffs, several hundred feet high, drop sheer into the sea; because in the middle of the fairway is a submerged rock, upon which any unwary navigator could speedily split his ship. Once past this cliff, and they were in a roughly circular basin, so extremely deep that it offered practically no anchorage, except close to the shore. The rocks around were bare and burnt, and they rose into ice-covered slopes that were lost in mist. Ships were there, however—whalers and a floating factory, for this haven was at that time the centre of the fishery. Steaming mist rose from the water; and it really was steam, for the ships were afloat above the crater of a volcano. Deception is still active. Ages ago it sank below sea level, and the waves drove a breach through a weak part of the crater wall; this breach, of course, is now the channel through which storm-tossed mariners sail when they desire some brief rest from the continual buffeting outside. Only two years before the *Discovery's* visit there had been a small eruption. The sea rose several feet, and began to boil; the ships hastily put off; and the shore at

one point slumped down beneath the water, doing considerable damage.

Marking whales was intended to be mainly the task of the *R.S.S. William Scoresby*, but although her crew succeeded in marking a number of the monsters, the earlier identification discs were not recovered, despite the fact that all mariners are offered a reward of £1 each for returning them to the Admiralty. The job of marking a whale is not so easy as it sounds. You start off with the traditional call of the lookout, "Thar she blows!"; and while your photographer gets a wholly admirable snapshot of the whale spouting up a white fountain of water, you with others tumble into the motor-boat and endeavour to reduce the distance between the whale and yourselves as fast as you can. If the sea is choppy (and it usually is), you dive head-first into a mountain of water, and as you reach its crest there is the whale, apparently indifferent to your existence. You drop into the trough, and the billows now seem to be extremely large and dangerous. When next you rise out of it the whale has gone. He has plunged below, perhaps to several hundred feet; will he come up underneath you, and throw you into the water? No, there he is, on the port bow. Steersman and marksman, the latter standing in the bows, must now co-ordinate their work to a nicety. You get within range, a 12-bore gun gives a loud report, and the whale is "shot". Actually, a strongly barbed iron, to which is attached a rustless, silver-plated steel disc bearing a number, has been driven well into its blubber; the monster has never felt it,

but should he be caught, experts later will enjoy telling you how he got there from the very different region in which you shot him.

Let us now see what the Norwegians were doing. However much one may dislike the wholesale slaughter of the hapless whales, it is impossible not to admire the enterprise and steadfastness, the courage and fine seamanship of our Norse cousins, who year after year cross the seven seas in their little ships, taking, as a matter of course, perils and hardships which to the landsman seem intolerable.

The modern development of the Antarctic whale fishery owes a great deal to the foresight of Consul Lars Christensen, who sent out eleven expeditions one after another in the effort to find new whaling and sealing grounds, cleverly utilizing the large "floating factories" as supply ships and bases for the smaller vessels which did the actual work. His most noteworthy contribution, perhaps, was to provide small seaplanes, which were carried to the Antarctic in packing-cases. During several years these machines were flown far and wide across the vast empty spaces of the Southern Ocean, across the pack-ice and over the fringe of the continent; it was a dangerous game, but by means of it the chief pilot, Captain Riiser Larsen, was enabled to map many hundred miles of the Antarctic mainland which no human eye had ever seen before.

Like the British, Consul Christensen foresaw that if the fishery was to be preserved, very much more must be learned about it. The first ship that he sent south for this purpose was altogether too small. She



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R.R.S. DISCOVERY IN PORT LOCKROY, WIENCKE ISLAND

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was the *Odd I*, a little whaler, only about 100 feet long and compelled to make most of her voyage under sail; nevertheless, during the summer of 1926-7 this small ship cruised among the grim precipices and glaciers of the islands near Graham Land, where bergs toppled over without warning, penguins congregated in thousands, and man was still something of a curiosity. It was not long, however, before the Norsemen had a depot ship with her attendant whalers, searching the misty and to some extent still uncharted sea for seals or richer treasure.

Professor Olaf Holtedahl, a scientist, now suggested to the Consul that more precise studies should be made in the Antarctic, the ships carrying trained men and adequate apparatus. This was done, and in the summer of 1927 we find the *Norvegia* ploughing her way to Capetown; with the professor and three other scientists on board. She was a little larger than the *Odd I*, but not much, being a sailing ship of 250 tons, about 125 feet long, fitted with a 350-h.p. engine, and equipped for oceanic research. At Capetown they faced the same problem as had so often limited the *Discovery's* cruises, shortage of fuel. As much coal as the little ship could possibly carry was loaded on board, sixty tons in sacks even being piled up on deck; but in the wild seas south of the Cape this deck hamper made her so unhandy (through stopping the easy outflow of water when she shipped a sea), that a great deal of it had to be flung overboard.

Bouvet Island, south-south-west of the Cape, was the first point of call. It is one of the loneliest

islands in the world, and surely the most difficult to find; for although it possesses three volcanic peaks they are almost always buried in mist, and as it is many hundreds of miles to any other island, and the surrounding sea literally breeds gales and storms, very few mariners have ever seen Bouvet. It was discovered more than two centuries ago, by a Frenchman (whose name it bears); he thought he had found a new continent, but nobody succeeded in sailing there for another fifty years. In 1825 the British landed and claimed possession of it, but never made any use of it; for although it is no farther from the Equator than York, it is always buried beneath snow and fog, and the far-ranging margin of the Antarctic pack ice creeps up quite near it during bad seasons, even in high summer. No one can land there, except on a small flat at the south-west end, and then only when the swell is not too severe. At Bouvet the *Norvegia* made two welcome discoveries. A little islet off the flat point was literally crowded with seals, and in the surrounding sea whales were spouting. The ship arrived during a storm, but hove-to, and next day (1st December, 1927) the captain and a boat's crew went ashore, hoisted their country's flag, and claimed possession. This gave rise to a dispute with the British government, but eventually Great Britain abandoned her claim to the island. Meanwhile, other boats' crews had landed on the islet and had begun the necessary but unholy business of slaughtering the seals; 800 were bagged, skinned, and the skins hung out in the rigging to dry. By great good fortune, they also

secured a whale. On Bouvet itself a wooden hut was erected, but of necessity it had to be close to the sea. The weather continued foul. While cruising round the island, the *Norvegia* met with a serious accident, running heavily aground on a submerged rock. She was got off again eventually, but began to leak badly, and the steam pumps had to be continually used to keep the water down. Despite this mishap, they continued their cruise in the neighbouring sea, one gale following another with monotonous fury, and the rare fine days were things to be remembered. Even the tough seamen described the state of things on board as "often quite dangerous", by which you must understand that as she rolled, a heavy sea would come up abeam or even astern, and sweep her dripping decks from end to end; but these little wooden ships are tremendously strong and will stand almost anything. From time to time parties went ashore; whether they got back or not without delay was wholly a matter of good fortune.

On the first day of 1928 they bade good-bye to Bouvet Island, and went south into the icy sea; then the leaks opened, and it became necessary to use the hand pumps as well. A day or two later the lookout shouted "Ice head!" and there, beyond the rolling blue waves, lay the long, flat floes, with patches of mist here and there. Perhaps more seals and whales lay beyond the barrier? The captain decided, after some thought, that he ought not to risk it(!) and he headed the ship for South Georgia, where they arrived a fortnight later. At Grytviken

she was examined by a diver, who reported that her keel was broken. To repair her would take many months; and while this job went ahead the scientists found much to do, some attaching themselves to whalers, others studying the reindeer on the island. These reindeer, by the way, were another instance of Norse enterprise. The first had been taken there from Lapland only in 1909, others, totalling twenty-three, up to 1925; they were turned loose, and now, despite many killings, the herd numbered several hundreds. These were the first and only large animals to be transported to the far south, apart from Sir Ernest Shackleton's famous Siberian ponies.

In the next season, 1928-9, the *Norvegia*, now commanded by Captain Nils Larsen, set out once more for Bouvet, to a rendezvous with the floating factory *Thorshammer*; the latter was one of a fleet of powerful steamers, up a ramp in the stern of which whales could be hauled on board and the blubber stripped from them and boiled. She also acted on this occasion as a supply ship, for she took out all the equipment for a meteorological station, including timber for two huts, powerful wireless apparatus, and many instruments. The sanguine people at home hardly realized then what they were asking. The sea ran wildly, for the tiny *Norvegia* to approach too near to the 7000-ton steel ship was to court disaster, and two days elapsed before anything could be done. They then managed to get a line on board and began to trans-ship the goods; but the line broke, and the whole job was so perilous that

both ships steamed south to the ice-pack, within which all motion is soon damped; and there at last the transference was completed. Having picked up further supplies from the floating factory *Python*, the *Norvegia* set sail for Bouvet; heavily overladen, she was difficult to handle in the gales and snowstorms which persisted in following her, and eventually the enterprise had to be abandoned and the goods were retransferred to the *Thorshammer*. They did try to land at Bouvet, only to find that the house which had been put up last season had been washed away.

The *Norvegia* then went on, against the wind, to her former haunt beyond Graham Land. Many of the mountainous little islands here are beyond the British sphere of influence. It was decided to take possession of one of them, Peter I Island, a long, narrow land, mostly fronted by steep cliffs, but with one ice-fringed bay. When trying to jump ashore, the captain was seriously hurt; for the boat, which swept back with the undertow as he jumped, dropped him into the sea, and then on the recoil crushed him badly against the rocks. He was hauled on board and taken to the ship. Next day they tried at another spot, where the Norwegian flag soon flew above the bare rocks (2nd February, 1929).

One of the ship's duties was to spot islands which, reported long ago, had "disappeared". There are many such in these seas. Perhaps a lookout had seen something black looming on the ship's quarter and had reported "Land". It could not be found, but it appeared in the log and was marked afterwards

on maps; such things often happen, because even small objects seem gigantic when seen through a sea mist. If any of these islands should be rediscovered, not only could Norway claim them, but they might yield seal rookeries. One such mystery island, Dougherty, was supposed to occur in the wild and stormy channel south of the Horn, but a search now (and a second one two years later) failed to find it. That concluded the season's work, and after $4\frac{3}{4}$ months at sea, in weather worse than they ever encountered at home, the crew went ashore at South Georgia and the ship was laid up for the winter.

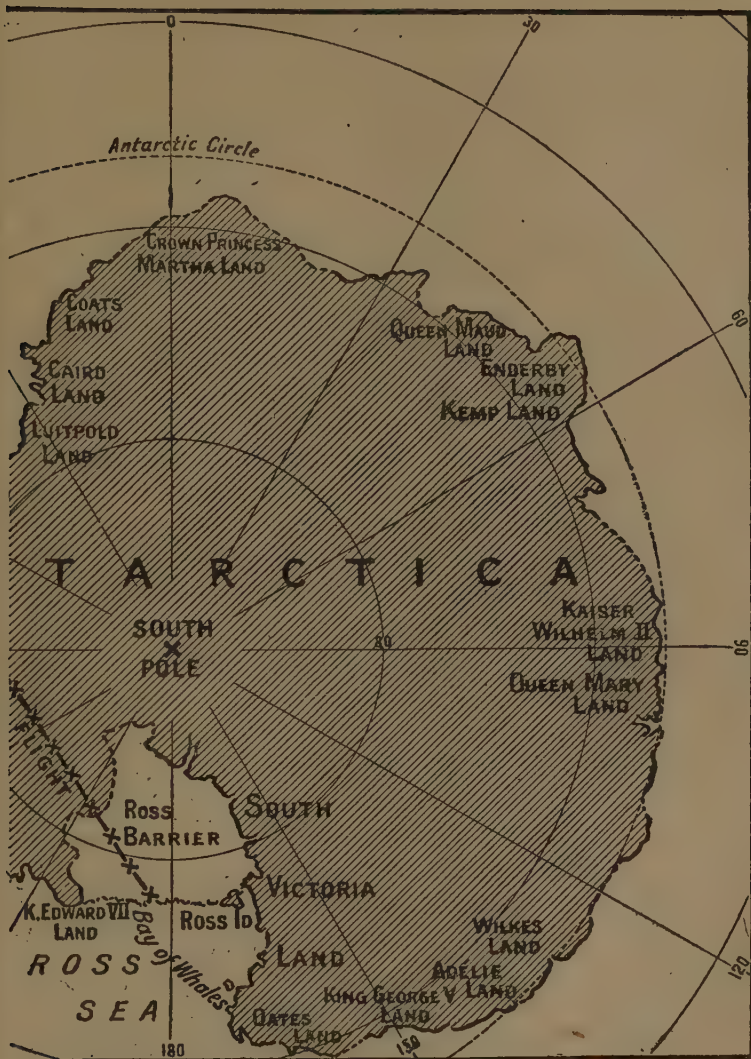
The 1929-30 season saw aircraft brought into play. They were taken out by the *Thorshammer*; one being a Lockheed Vega monoplane (a Ford was used during the same year by Byrd in his famous flight to the South Pole), and the other a tiny naval Hansa-Brandenburg (Fi8) monoplane. The pilots were to be Captain Lutzow-Holm and Captain Riiser Larsen; both had experience of Arctic flying, Captain Larsen having been with Amundsen in the thrilling 1925 flight from Spitsbergen, again in the flight across the North Pole, and he also participated in the search for survivors from the *Italia*. To fly in the Antarctic, however, has special perils. One must have open water from which to take off, and the same thing should be available on the return. The ship, a tiny object, is soon lost in mist, there are no normal landmarks, and to find her again after having covered some hundreds of miles would not be easy; moreover, the terrific effect of a full-

powered Antarctic gale might conceivably be disastrous even while they were in the air. Nevertheless, it was thought worth the risk, because large stretches of coast east of the Weddell Sea (where the British Quadrant of the Antarctic mainland ends) were quite unknown, and Norway desired to claim them.

Once again the rendezvous was near Bouvet Island, and once again the weather was as bad as it could be. The *Norvegia* had already made a landing, however, and despite great difficulties Captain Nils Larsen, now quite recovered, had erected a house on the tip of the main island, and another on the seal islet. The ships met on 27th October, yet such was the sea that twelve days passed before the aircraft and passengers could be trans-shipped. The planes were assembled, a number of flights over the elusive Bouvet peaks were made, and some rather poor photographs secured through the enveloping mist. The gallant little ship then turned her nose south, headed into the pack, and spent nearly a month in the ever-changing channels of blue water between the floes, and in constant danger of being nipped, before her pilots could take off. On 22nd December the airmen flew off towards Enderby Land, more than one hundred miles away. To provide against accidents, they had a tent, skis, a sledge, food for several weeks, and radio; and to help on the return journey, the chief features of outstanding icebergs were sketched as they passed them, although of course these objects might look very different when seen from the other side. After seventy-nine minutes' flight—a journey which no ship short of



FALKLAND ISLANDS DEPENDENCIES



AND ANTARCTIC MAINLAND

an ice-breaker could have made at all—they saw the edge of the inland ice rising ahead. It stretched right down into the sea-ice, but farther on was a patch of open water, and here the two planes came down like graceful birds, close to the beach. The airmen got ashore, and made for some distant rocks, intending to take specimens, but instead they only got their first taste of Antarctic weather. A cloud had been observed over the ice-cap; it was now thickening, and betokened, if not a gale, at least heavy mist. When they returned to the planes they were only just visible. They got into the air, flew out of the fog, and by the iceberg beacons found their way back to the ship; without that help, they might have been lost after all, because more mist surrounded the *Norvegia*, and they could not discern her until it providentially lifted.

The ship now forced her way out of the pack again, to meet the *Thorshammer* and take coal on board. On 14th January a strange sail was spotted. It turned out to be the *Discovery*, now under Australian control, with the famous explorer Sir Douglas Mawson on board; he, too, was keeping abreast of the times, although his own Antarctic exploits were nearly twenty years old, and he was as ready to fly over the mainland as any man. You may remember that in 1912 Mawson had made a very fine journey towards the South Magnetic Pole, in a part of the continent where gales from the interior hardly ever ceased throughout the year; and that after his two companions had perished, he struggled on indomitably against great odds, only to find on reaching

safety that his ship had gone home without him.

After two pleasant days with the British, the Norsemen continued their voyage. Further flights revealed a coast beyond Enderby Land; a flag was dropped, and it was called Queen Maud Land. The ship meanwhile was in considerable difficulty through again having too much coal on board; but the seas which repeatedly washed over her soon eased her of some of that burden. On 18th January she suddenly ran into another peril, being in danger of nipping by the ice; all hands were turned out, and after twenty hours' hard work she was freed again. Open water, a blue, smiling ocean, lay (as it often does) off the entrance to the Weddell Sea. They therefore turned south, and from the ice-edge the *F18* took off and discovered more new land, which was named Crown Princess Martha Land. Then storms broke over the *Norvegia* once more, but the wind was from the land, and this always has the effect of blowing any loose pack-ice far away to sea; nevertheless, she now looked like a fairy ship, everything from crow's nest to water-line being covered in frozen salt spray. As soon as the sea showed signs of freezing over, the hint was promptly taken; Captain Larsen went north once more, trans-shipped his aircraft to the *Thorshammer*, and gave his crew a well-earned holiday at Capetown. In this season he had discovered 570 miles of new coasts, besides taking many "stations" similar to the *Discovery's*, and under the most discouraging conditions.

To conclude the story of this little ship's remarkable wanderings, in the season of 1930-1 she sailed

right round Antarctica, sounding, collecting water-samples and small life, and thus enlarging and complementing the work of the *Discovery*. Bouvet was not forgotten; but the island proved hopeless as a base for any purpose. It was as stormy as ever there; nevertheless, the captain had a boat swung out, in which at the risk of his life he got ashore. The hut had once again been swept away by the sea. A visit to the seal islet showed the same state of affairs, except that a huge mass of ice weighing several tons had been hurled ashore by the ocean, and had crushed the house beneath it.

When in May, 1931, the *Norvegia* again rounded Sandefjord, and the beloved mountains of the north-land hove in sight once more, a very fine piece of navigation came to a close. She had been more than 60,000 miles during her wanderings, most of it in the roughest seas to be found anywhere.

The work commenced by these ships, British and Norwegian, was continued right down to the outbreak of war with Germany in 1939. The two chief ships concerned, the R.S.S. *William Scoresby* and *Discovery II*, sounded and searched the world-wide Southern Ocean time and time again, in the monotonous but necessary work of "making stations". The *Discovery II* was engaged on her fifth cruise in 1939; the *William Scoresby* had marked more than five thousand whales, and in these last years the results were beginning to come in; nor did the Norwegians cease their voyages either. All of that, however, makes a rather long story, which we must relate at some other time.

CHAPTER IX

Flight across Antarctica

We have been round Antarctica in ships. We have seen how governments and private individuals both found large sums of money, so that the most exact information could be obtained from that inhospitable quarter, with the object of making more money by the maintenance of a valuable fishery. If there was adventure in this, it was because those who sail the southern seas cannot avoid adventure even if they would. Now let us look at another class of men, men who for forty years at least have been drifting to the Antarctic wildernesses because there, above all other places on the earth, adventure, difficulties, dangers, and a "free life", were certain to be found. After the great pioneer journeys of Scott, Shackleton, Amundsen and Mawson before the 1914-18 war, the main features of Antarctica were known; it was a huge frozen ice-plateau, fringed by mountains up to 15,000 feet or more in height, possessing no vegetation and no ground life of any sort. It was "The Home of the Blizzard", "South", and "The Worst Journey in the World". Nevertheless, a great deal remained utterly unknown about this ice-covered continent. For instance, on the two opposite sides which front South America and New Zealand respectively are the large indentations of the Weddell and Ross Seas. They gave Antarctica a sort of

"hambone" shape, and their inner parts were largely unknown; hence the theory naturally grew up that the continent might comprise two great islands, separated by an ice-filled strait. This idea prompted flights by Rear-Admiral Byrd, after he had once satisfied his desire to fly over the South Pole in 1929. It also prompted another aviator who had been dreaming of that region ever since, as a young man, he had attended the funeral service to Captain Scott in London, in the year 1913. This aviator, Mr. Lincoln Ellsworth, was no novice at polar flights. Like Riiser Larsen, he had accompanied Amundsen on the famous flight towards the North Pole which had so narrowly missed being a famous disaster; he had, in fact, provided most of the sinews of war which made that flight possible. Then he had joined with another adventurous spirit, Mr. (now Sir Hubert) Wilkins, who at one time thought of taking a submarine beneath the North Pole, and who afterwards took to aviation like a duck to water, and made some very notable flights around Graham Land, at the opposite end of the earth. How we all thrilled at the mention of these ideas, only fifteen years ago! And yet it is now so commonplace that the Soviet Union could calmly drop a party on the drifting floes off Siberia, and pick them up again several months later, when the frozen platform that carried them was nearing Spitsbergen. The immense development of aviation has made all this possible; but even aviation could not have saved Ellsworth and his companion in Antarctica, had they not saved themselves.

Many years ago Sir Ernest Shackleton conceived the idea of pushing a ship to the head of Weddell Sea, landing there, and marching with a select party right across Antarctica, until he came out at the Bay of Whales or Ross Island, where relief could certainly reach him. You may remember that this programme was actually attempted; but the ship, the *Endurance*, belied her name, was crushed in Weddell Sea, and Shackleton only rescued his men from death by truly heroic exertions. Now Mr. Ellsworth proposed a similar crossing, but in a different way. He would take an aeroplane by steamer to Ross Sea, fly right across the ice plateau and be picked up by the whalers or sealers in the seas off Graham Land or Deception Island. To give the adventure some scientific value, he would take a cinematographic camera, so as to procure a strip photograph of the landscape along his route. Apart from this, the expedition was simply an adventure, and as aviators were being extremely venturesome in those days, and were putting governments to great trouble and expense in searching for them after they had fallen into the sea or crashed in the middle of the desert, the press of this country did not pay very much attention to Mr. Ellsworth or his plans. Adventure it certainly was, but it was far from being scatter-brained, and was, in fact, very carefully thought out; you will find such to be the true history of most successful enterprises, the unseen work before the start being repaid twentyfold in the end. He had studied the winds, the weather, and the lie of the land, so far as they were known (which was very

little). He had been told that if his machine had to land on the frozen ice-cap, it would almost certainly be damaged by the snow ridges, or sastrugi, which are thrown up by the wind, and which make sledging very difficult at times; but a study of all the photographs convinced him that this danger could safely be ignored. He knew perfectly well that if he came down through engine trouble in mid-continent he was doomed, and so did his companion, Mr. Herbert Hollick-Kenyon, of Canadian Airways. To provide some possibility of escape, however, they took a sledge, skis and snowshoes, sleeping bags, a tent, heating stoves, fuel oil, and sixty-one days' full rations (at sledging rate) of 34 oz. per man. The route finally selected was also parcelled out into sections. The aviators had a powerful receiving and transmitting set on board, and if they came down in a given section, it was intended that they would try to march towards agreed points, and that aviators from a ship base would try to relieve them. Eventually the camera equipment was reduced to an ordinary Leica instrument. Everything was provided for beforehand, except what actually happened. The radio failed. Both men were skilled navigators, yet they got off their course and for some time were lost. They came down in the middle of the continent. They were caught on the ground in a blizzard. Finally, the plane landed for the last time before they reached Byrd's old base at the Bay of Whales, and they had the greatest difficulty in finding Little America when they did reach it. Despite all this, they survived to tell a most stirring story.

The first plane that Mr. Ellsworth took out, when he made his original attempt in 1933, was a modified Northrop Alpha, an all-metal monoplane with low wings, the idea being that when grounded she might bear the brunt of a gale without spinning several miles across the ice. The machine had short, wide wooden skis sheathed with metal; they were interchangeable with floats and wheels that could be lowered on an under-carriage, thus making the occupants able to land on the ice, on the sea, or on land indifferently. The 600 h.p. Wasp engine was expected to give a speed of 215 miles per hour. To transport everything across the Southern Ocean, Mr. Ellsworth procured a single-decked Norwegian fishing boat of 400 tons, fitted with a motor, and strengthened in bows and stern for the severe job of ice-ramming; she was renamed the *Wyatt Earp*, and besides the plane and equipment she carried sufficient food and stores for a two years' cruise.

By the end of the year (the Antarctic summer), they approached the Bay of Whales, landed, and in January, 1934, made a successful trial flight. Then, with that rapidity which to readers of Scott and Shackleton must be only too familiar, a gale came on, the ice broke up, and the machine was crushed beyond repair.

Ellsworth changed his plans. He now proposed to start from Deception Island or some similar base on the opposite side of Antarctica, and to fly to Little America, i.e. near to the scene of the recent mishap. Eight months later he was back in the south with a new plane, which had been christened

the *Polar Star*. Besides Hollick-Kenyon, his co-pilot, he was accompanied on the *Wyatt Earp* by Sir Hubert Wilkins. At first prospects seemed good, but the weather failed them hopelessly. It had been agreed from the start that to take off in anything but weather promising some sort of stability for a day or two would be suicidal; and in three months of dodging from island to island, and floe to floe, they had but twelve hours of real flying weather. A flight from the volcanic Deception Island failed; so did a second from Snow Hill, much farther south, and close to Graham Land. The project was abandoned, and the *Wyatt Earp* sailed north with her disappointed complement. After the Antarctic winter, however, the unbeatable Ellsworth was back again, in the same ship, at the same place, and at last fortune smiled on his persistence.

There were very few places where the heavily laden plane—the total load was $3\frac{1}{4}$ tons, a very considerable amount for those days—could safely take off; but a suitable snowfield was found on Dundee Island, about eighty miles north of Snow Hill. On 21st November, 1935, they shook hands with their friends, climbed into the machine, and vanished towards the south. The flight was on! Unhappily, however, misfortune was to test their constancy still further. They had covered about 600 miles, with the ice-covered sea below and the great mountain chain of Graham Land on their right, when it was discovered that the fuel gauge was clogged. Wisdom dictated an immediate return, and after $10\frac{1}{2}$ hours in the air they regained the base. Next

day the machine was once more overhauled and refuelled; at 2 a.m. on 23rd November they were awakened. At four minutes past eight that morning, in what must have seemed ideal conditions, they took to the air again, and this time there was no turning back. Underneath them the blue sea sparkled in the sun, the steady throbbing of the motor was music to their ears, and Graham Land steadily slipped away behind them. They climbed to thirteen thousand feet, from which height at length they looked up a gap that Wilkins had found some years earlier, and which was believed to cut off Graham Land from the continent; it was deep, narrow, and looked like a fjord. Beyond were more mountains; they looked so grim and gaunt that they were named the Eternity Mountains, the three principal peaks being christened Faith, Hope and Charity. Fortunately, these high rock masses, with their ice-flecked slopes, did not buttress up a very great mass of the plateau ice, being quite unlike the other side of Antarctica. Byrd had found difficulty in getting enough ceiling to surmount the plateau at all, and he only did so by throwing out precious parcels of food, for the plateau there was 9000 to 10,000 feet high. Here, however, it did not exceed 6000 feet, and the plane was steadily moving along some 4000 feet above it.

After several hours, they noticed that the ground speed appeared to be much below what it ought to have been; the strong wind too was drifting them to the east. On the right hand they continued at intervals to pass the summits of single peaks, or of lines of a few peaks at most, entirely surrounded by

the frozen plateau; and then for a stage there would be nothing at all but the white surface, the noise of the motor, the scratching of the navigator's pencil, and the sense of utter loneliness in an otherwise empty world. After $8\frac{1}{4}$ hours in the air came their first misfortune. They had reported progress to the ship as arranged, when they began to receive the message, "Polar Star, Polar Star, are you there? We can't hear you." The transmitter had broken down; but they were so far out now that there could be no turning back. They continued the flight, leaving their friends on the *Wyatt Earp* puzzled as to whether or not they had crashed; and hours later the two airmen still picked up the message, "Polar Star: we cannot hear you!"

In the late afternoon they got a sight by the sun, and this provided shock number two. They were, or appeared to be, more than 200 miles off their course. You must understand that they never had any intention of flying over the South Pole itself. Their route was on what we described in our first chapter as a Great Circle course, so marked as to take them above the probable line which the mountains would follow; thus if the ice-filled water channel that theory said might separate the continent into two pieces had any real existence, they stood the best chance of perceiving it. They did not find any such channel; but the ice-cap was clearly limited in this direction, because from time to time desolate little lines of peaks appeared, some fairly near, others right away on the horizon. At 7 p.m. a flag was dropped from the plane, and the under-

lying "ground" named James W. Ellsworth Land, after the pilot's father. A little later he named some distant mountains after his wife. Then came shock number three. They had been fourteen hours in the air, the light was getting bad, and mist drifted over the ice below; when Hollick-Kenyon, who was at the controls, handed him a note, on which he had scribbled the dramatic message, "I really have no idea where we are." To continue under such conditions was obviously impossible. Whatever difficulties they encountered in getting down, and however poor their chances of becoming airborne again, it was imperative that they should land and ascertain their true position. Accordingly, at 9.55 they made a risky landing through the fog, and crumpled the fuselage in doing so.

They scrambled out, and found themselves on a surface of hard snow, which disappeared into the mists on every side. A tent was set up, a cooker started, and the wireless examined. After some time they tried to transmit messages to the ship, only to receive the monotonous reply, at regular intervals, "Polar Star, are you all right? We cannot hear you." The weather now cleared sufficiently for them to see the sun, and Ellsworth began a series of observations, which lasted twelve hours. During this time he was oppressed by the ghastly loneliness and desolation all around him, and he confesses that he was glad to get back to the tent. The observations were worked out, and the result was not encouraging. They had expected to be almost across the ice-cap by this time; instead, they had several hundred

miles still to go. The South Pole was away to their left rear, 750 miles off, their starting point at Dundee Island lay 1550 miles behind them, and the coast where Riiser Larsen and his comrade had flown a year or two earlier lay several hundred miles to the north. They were acutely conscious that their lives now depended on luck, one motor, and the balance of the petrol in the tank; and of these things the most important—good luck—still eluded them, for they could not put the sextant right. However, it was no use taking too gloomy a view, so they hoisted the American flag on the wireless mast, and claimed the whole of the "country" between 80 and 120 degrees West Longitude for the United States, a claim, by the way, which was not likely to be seriously contested!

The weather was now worsening and snow looked imminent. After nineteen hours in camp, however, they decided to continue, and at 5 p.m. on 24th November again got off the ground. But the beginnings of a blizzard enfolded them, the driving snow made further flight absurd, so after half an hour in the air they descended once more, and this time made a perfect landing. At Camp II they erected the tent, got out the sleeping bags, and learned the first lesson of the Antarctic explorer, to wait in patience until things improved. They were there three days, throughout which drift snow, as fine as powder, curled and swept uncertainly about them, coating the plane, filling every crevice, and making any solar check on their position quite impossible. At last they got sufficient angles to give

them a rough idea of where they were. They cleared away the snow, clambered on board the Polar Star, and for the second time became airborne without much difficulty; but almost immediately they ran into fog, a real blizzard assailed them, and after covering only ninety miles they came down on the ice-cap once more. Here, at Camp III, the prospects darkened decidedly. They got the tent up, took refuge within it (having first secured the plane against its running away), and decided to remain grounded until the storm was over. Snow whirled into the tent, like fine white powder, and more snow weighted down the cover, seriously reducing the space inside; meanwhile the wind was tugging and straining at the whole thing, with the apparent object of blowing it off Antarctica altogether. Not until 1st December could they attend to the plane. They spent the time in talking, sleeping, and trying to fix the sextant. The food supply was ample, because they ate little; on the other hand, the petrol position was very grave; they were still six hundred miles from Little America, and Ellsworth felt convinced that the available fuel would not suffice. One worry was removed, however, by the discovery that the sextant, which had a large index error, could readily be adjusted; this was done, and thenceforward they would at least know where they were going. They also worked out their course, and found that during the first and most dangerous part of the flight their speed had been only ninety-two miles per hour.

On 1st December they went out to the plane; it was buried in drifts and in some danger of becoming

a solid mass of ice. Shovelling away the snow was easy enough, but to extract the fine stuff from the controls with a teacup proved a trying job; and all the time the blizzard was threatening to return. They provided some sort of shelter, however, by building a screen of snow blocks round the machine and the tent. On 3rd December they tried to start the engine, but the magneto burned out. They then warmed the motor for an hour and tried again, with no better luck. Things were now at their blackest, when one of the pilots had the idea of covering the motor with a canvas hood and placing the stove inside. This warmed it up, but although they both cranked the engine repeatedly it choked and stopped again. Hollick-Kenyon then connected the radio battery to the starter, and this did the trick. One may doubt if either of them ever heard a more pleasant noise than the roar of the motor at that instant. Everything possible was now taken out of the plane, so as to lighten it, and it was then driven out of the drift on to the even "ground" beyond. They loaded up, took down the tent, clambered on board, and at 7.20 p.m. on 4th December once again took to the air, having been prisoners on the ice-cap for just a week. The weather looked doubtful, but they flew out of the storm zone into a beautiful starry, calm night. Hour after hour they rushed north, and when they were again compelled to come down again for a short time they were over the ice barrier of Ross Sea and only 145 miles from the Bay of Whales. Ellsworth, however, had a frozen foot, and they were by no means wholly safe as yet. They

took off again, knowing that practically no fuel remained, and fifty minutes later the engine coughed and stopped, the Polar Star dropped into a glide, and was gently brought down to the Barrier surface without mishap. It was five minutes past ten at night; three hours earlier their prospects had looked hopeless, and to anything but an airborne party destruction would have been inevitable. They were now only about sixteen miles from the Bay of Whales, but were not quite certain which way to march; so they established Camp V beside the plane, and sought rest.

Now began an exciting search for the elusive Little America. There was a strong wind blowing out to sea from the Barrier, and they decided to dig trenches and let the skis down, so that the plane lay nearer to the surface. This was on 6th December, after another lost day; but time was of no great importance, because their friends on the *Wyatt Earp* could not possibly have half circled the continent yet. It was important, however, to get into Rear-Admiral Byrd's old quarters, where alone they could be sure of supplies, warmth and some relief for Ellsworth's frost-bitten foot. They had noticed some moundy ice to the north-west, which they supposed might be the tops of the buildings, but after marching towards this spot for two hours, without seeming to get any nearer, they abandoned the effort and returned to the plane. A gale then kept them confined for two more days; but on 9th December they packed ten days' rations on their sledge and started off for Little America. They had so little idea

of Antarctic travel that they left their tent and sextant behind them as unnecessary! After hauling the sledge over a very heavy surface for nine miles, they found that the object which had been seen was only a pinnacle of ice; it was impossible to camp without being speedily frozen to death, so they left the sledge and marched back for the tent and sextant—another improvident action, since a sudden blizzard might have cut them off from both their bases. When they regained the sledge, they were so exhausted that they just stuck up the tent and crawled under it. An observation next morning showed them to be about twelve miles from the Bay of Whales. This is not an ordinary bay, in that all the “land” comprising its line is solid ice, some of which lies aground; and as sections of the cliff are constantly tumbling into the sea it changes its shape from time to time, although its general position remains unaltered. The wind had now dropped and the sun was shining brightly when (11th December) they set out for the bay. Some nasty crevasses had to be crossed, but although this was done, and they pushed on for about ten miles, the ice still stretched unendingly before them. Then Ellsworth spotted at last a line of blue water on the horizon; alas, it was in such a place as to show that they had overshoot the bay and must go back. Next day, 12th December, although they hauled their sledge another dozen miles, there was no sign of the water which they had discerned the previous evening; and yet they could not have been far from it. They camped in raw mist, and in raw mist they started, with the

wind whirling up the drift snow into fantastic figures, as if the Barrier surface were dancing; but they had to go on or perish. This day, after another ten miles' hard pull, they rose to the summit of an ice-pressure ridge, and there below them was the sea at last; there was no sign of Little America, but at least they now had one definite guide-mark. On the 14th they took another solar observation: ten miles too far to the north! So back they went on the 15th, until finally they reached the unloading place of the Byrd expedition, where they found a couple of tractors half buried beneath the snow. It seems scarcely credible that they should have required ten days to find this spot, and yet it was so. To pick up the camp at Little America was now easy, although nothing was to be seen of it except the masts and chimney-pipes of the buildings; everything else was buried beneath the snow. They broke through a glass skylight and let themselves down into the radio hut; at last they were safe.

On 16th December they dug a channel into Little America, entered by the proper opening, and started cleaning up inside; all that they had to do then was to make themselves as comfortable as possible and to await the arrival of the ship. Seen from the other angle, however, the problem was more serious, because those on the ship had no certainty as to whether Ellsworth and his comrade were alive or dead. A message had accordingly been radioed, detailing the circumstances, and although the aviators did not know it, a British ship—the *R.S.S. Discovery II*, which was carrying on the work detailed in the

last chapter—was now on her way to the Ross Sea.

Meanwhile, the two men at Little America took stock of their position. Every day, despite his bad foot, Ellsworth walked down to the abandoned tractors, where he set up a tent and two yellow streamers and left directions for any search party who might arrive; but for precisely a month he walked in vain. Then, on 15th January, 1936, he was awakened by Hollick-Kenyon, who had heard the noise of an air engine. He rushed out, to find himself enveloped in grey mist, a mist which had clung around them persistently for a whole fortnight. Down through the mist floated a parcel—food, attached to a parachute! With it was a note from Captain Hill, of *Discovery II*. When the alarm had been given, she was working off the edge of the pack-ice, midway between Australia and South Africa. She was at once recalled to Melbourne, and within three weeks of receiving the news that Ellsworth was “missing”, the ship was on her way to the Bay of Whales, carrying two aeroplanes and seven airmen. On this very morning, 15th January, she entered the bay, after forcing her way through 400 miles of heavy pack-ice in $7\frac{1}{2}$ days. A Moth aeroplane containing Flight-Lieutenant Douglas and Flying Officer Murdoch flew over Little America. Hollick-Kenyon went out to the flags, where he was picked up by a party from the ship. Ellsworth, who followed him out despite his frozen foot, was taken on board next day. The news was at once telegraphed all over the world, and was answered by a

message that the *Wyatt Earp* was also approaching. Within a very few days she arrived; and so ended one of the most remarkable pioneer flights on record.

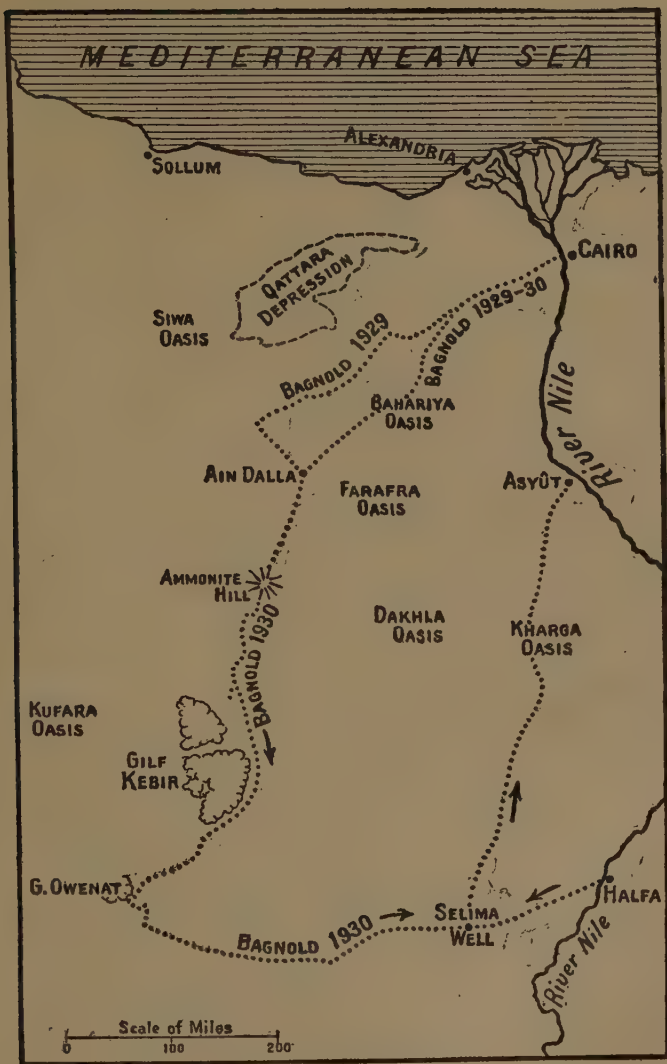
CHAPTER X

Across the Desert by Car and Plane

The news pictures of the North African campaigns have given us all a pretty clear idea of what the Western Desert is like. We have seen the flat, white, eye-aching expanse, covered with loose stones, without a bush, a stream, or a living thing; every object above its surface throwing hard shadows, unless obscured by a sandstorm approaching like a rolling bank of fog. This, however, is only the edge of the Western Desert. Beyond the muddy, boggy hollows of the Kattara Depression (which runs all the way from Alamein to the Libyan frontier) the desert stretches nearly six hundred miles to the Sudan, an absolutely empty waste, except for one or two oases which lie sunk within its surface; when you climb out of the Nile valley and look to the west, this grim and unspeakably lonely wilderness of stones confronts you, and you know only too well that the shimmering lakes and suggestion of trees that dance in the air are but a mirage. Until less than twenty years ago a large part of this desert had never been crossed by a white man, and that it is

now comparatively well known is due solely to the use of motor cars, caterpillar tractors, and aircraft; the cars, useless in the immense dunes of southern Arabia, here had a better chance, although their employment was not devoid of thrills and some danger.

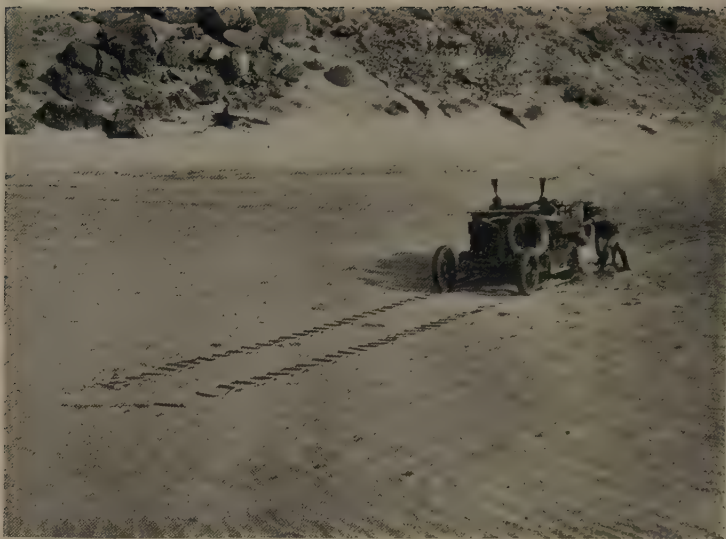
Deserts are strange places, occupied by wandering spirits (according to credulous natives), who lure the curious to their destruction by waving pictures of water and trees before their deluded eyes. Water-holes, rare at any time, are particularly hard to find in the Western Desert, because in such flat country one might go right past the well without perceiving it. Landmarks, apart from certain lines of dunes to which we will refer later, do not exist. Unless the traveller, therefore, knows exactly the position of the oasis, he may be steering towards his doom. When, in 1929, Major R. A. Bagnold, of the Royal Corps of Signals, decided to take cars out into this desert, he was doing a highly venturesome thing; but he had two very good motives. In the first place, to the south of Siwa Oasis (which lies back from Sollum, on the Libyan border) there extended a very large and almost completely unknown mass of dunes, literally forming a Sand Sea; it had never been crossed, and fifty-five years had passed since a German traveller named Rohlfs penetrated into it. Having been told that no cars could get over this dune country, Major Bagnold decided to go there and find out for himself. The second reason was the long-standing existence of a mystery. Many years ago, it was believed that a substantial oasis called



LIBYAN DESERT
 Showing Major Bagnold's Routes, 1929 and 1930

Zerzura existed somewhere in the Western Desert; but this had never been found, and the gallant Major intended to be the latest explorer to seek it. We ought to explain that on the Libyan side of the border, well out in the desert to the south, is a well-known oasis called Kufara; the home of the Senussi, it had been occupied by the Italians, but even so, the sight of a white traveller there was still sufficient to bring him a doubtful reception. To Kufara Mrs. Rosita Forbes made an adventurous journey in 1921, accompanied by Hassanein Bey, an Egyptian. Two years later Hassanein Bey repeated the journey, this time taking instruments to map his route, and he then went on for hundreds of miles south and west, until he eventually got to French Equatorial Africa. Two years after that, another enterprising Egyptian, Prince Kemal al Din, followed the same general course, but struck down to the Libyan edge of the Sudan boundary, 600 miles to the south, where he obtained water at the base of a flat-topped desert mountain called Owenat. On the way, he passed on his right hand another desert mountain range (as it seemed), which was faced with gaunt, vertical cliffs more than a thousand feet high; this he named the Gilf Kebir. The Gilf was a third magnet to Major Bagnold, for Kemal al Din had seen it only from a distance and nobody else had ever heard of it.

On his first journey, during the winter of 1929, his equipment underwent a very severe test in the dunes of the Sand Sea. He took two 30-cwt. Ford lorries, as well as an ordinary Ford touring car; all



EXTRICATING A LIGHT CAR FROM SOFT SAND. ALL HANDS, PUSH!

By Permission of Brigadier R. A. Bagnold



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EXTRICATING A LIGHT CAR FROM SOFT SAND. CHANNELS
UNSHIPPED AND LAID IN FRONT OF REAR WHEELS

By Permission of Brigadier R. A. Bagnold

were loaded to capacity, and the lorries continually stuck in the sand, but the car was a decided success. It being necessary to save every drop of water, each vehicle was fitted with a "desert condenser", an arrangement by which the overflow from the radiator is blocked, loss of water through evaporation and splashing being thereby avoided. The only disadvantage is that when the water boils the car must be stopped until the radiator has cooled down again. To help the cars through soft sand, they carried two pieces of steel channel, each weighing about 30 lb. and five feet long, likewise a pair of rope ladders. Whenever a car came to a really soft place its wheels dug in as if they were bogged. It was then necessary to get out, shovel away the sand from the rear wheels, and put the channels under them; this firm support usually sufficed to help the car forward again. For finding their course (which in the featureless desert was much the same as navigating a ship at sea), they used an ordinary aero compass, but it proved unsatisfactory, owing to the magnetism of the car. In the 1930 expedition they took a special "sun compass", in which a large vertical needle cast a shadow on the dial; this device worked excellently.

Starting from Cairo, the three vehicles made for the south-west of the Kattara bogs, where they soon found themselves trapped in a maze of dry gullies, the powdery clay floors of which were the only possible roads; but the stuff was so soft that the lorries went in axle-deep and needed jacking up before they could be extricated. Once out of this

maze, a speedy if somewhat bumpy ride over the rocky surface of a dead flat plain brought them face to face with the eastern wall of the Sand Sea. There were, of course, no roads at all; one steered by compass and hoped for the best. They soon found that the Sand Sea was made up of parallel ridges of dunes, each only a few scores of yards across, but up to twenty miles long and more than 300 feet high; they faced east like the gigantic rollers of a brown ocean which had been frozen in the very act of toppling over upon the flat desert floor. The sand of the walls was so soft that it proved no easy matter to climb one on foot and it was impossible in a car. Fortunately, the lines broke after a few miles, being arranged slightly behind one another, i.e. *en echelon*; thus, by winding round the end of one ridge and back again along the reverse side of it, the explorers eventually passed six complete ridge systems. At some places the threatening crests approached so close that the flatter sand between was all swallowed up; and then there was nothing to be done but to turn around and try some other passage. At other spots the hard floor between the ridges concealed patches of sand so liquid that the cars on entering them lurched forward as if tumbling down a step and came to a halt, bedded to the axles. It was then necessary to get out, shovel away the soft stuff as much as possible, and thrust the end of a steel channel beneath the tyre. This gave it a purchase, by which the driver forced the car to lurch forward several feet; and as the soft patches were usually small, two or three such efforts generally

extricated the vehicle. After a time, the drivers became more or less sand-conscious, and instinctively steered aside on approaching these dangerous places; but at some spots they had to go ahead cautiously on foot before a route could be found. At the end of it all, they emerged on a rolling waste of lower dunes, forty to sixty feet high. There was no shadow to guide the drivers, and although the sand was reasonably hard, forcing a car across it at forty miles per hour was like driving on a scenic railway. They therefore abandoned further efforts and returned along their own outward track. It would have been simpler to have climbed the easy western sides of the dune ridges direct, but the drop on the eastern front was too steep for any vehicle to attempt without turning over. On the way back, they went to a well-known water-hole, Ain Dalla, which lies in the desert 300 miles from Cairo. It occupies a hollow, surrounded by cliffs. Drift sand provided a way down, but in getting out again they broke an axle and had to send all the way to Cairo for another. The well itself rises from a sandy mound thirty feet high in the middle of the hollow; it was filled with drift sand, but when it was cleared, warm and sulphurous water flowed out of it.

Next year, they profited by the lessons of this first trip. (Incidentally, we must notice the ease with which in a few hours a well-equipped car party crosses hundreds of miles of desert, a span which would mean many days to a camel party and the almost certain loss of some of those valuable beasts.) The journey, too, was much more ambitious, since

it included a visit to Owenat, at the extreme south-west corner of Egypt, more than 600 miles away. The trucks were abandoned in favour of three Ford cars; one particular merit of the Ford, of course, being that it is heavily over-powered, the strong engine enabling it to cover very rough ground without undue strain. Everything that gave unnecessary weight was stripped off, for every ounce was needed for food, fuel and water. They reckoned that each car, if properly loaded, could carry 1700 pounds of these three items in addition to its occupants; and if it used a gallon of petrol every fourteen miles, that would give it a self-contained radius of action of 1200 miles. To replace petrol used during the early stages, a camel party was sent off with 500 gallons to Ain Dalla. Water was carried in new two-gallon petrol cans, which were bolted to the running boards on either side; and it kept well. The sun compass, which enabled them to take proper bearings of their route for the first time, has been mentioned already.

Leaving Cairo on 13th October, 1930, they arrived at Bahariya Oasis next day, where they found that their reserve petrol had been dumped by mistake. Another camel party was rounded up, which took it on to Ain Dalla; meanwhile the cars made a second attempt to cross the Sand Sea. They now practised a necessary trick, which, however, reduced their rate of travel very much. Whenever they came to soft sandy places the air pressure in the tyres was reduced to one-half, so as to lessen the sticking. On the other hand, rocky places required a hard-pumped tyre, otherwise the tyres

would have been hopelessly damaged. At the limit of their advance, they were still in known country. That night they camped in the middle of the Sand Sea, sleeping in the open, without tents; one car kept off the wind, the headlights of the other two provided illumination, and the stars overhead looked down unwinkingly at these venturesome, not to say inquisitive Europeans who thus dared the genii of the desert to do their worst. We need hardly remark that the genii did not put in an appearance. Cooking at these desert camps provided a problem. The Primus stove would not work in open desert country, so they carried a special fire-pot, made out of the ever-serviceable empty petrol tin; the lid was cut off and a water-pot inserted. Wood from the cases provided the fuel.

On the way back, their attention was attracted to a solitary pillar of rock which stood up sixteen feet out of the dune country. It was a particularly desolate place, yet the sand at its base was covered by the skeletons of hawks, jerboas, and little birds: all had come to this landmark in the dry wilderness, probably with the hope of finding water, and had died there. Many little birds were seen in this region, mostly pied wagtails; their hard struggle to live had made them almost pathetically tame. Hawks hovered overhead, searching for such prey; on the ground there were lizards and a kind of sand hopper, commonly also a few dead locusts. Only one single living plant was found in the whole of the Sand Sea. Far to the south-east, however, where there is a break in the desert floor, which makes part of it

stick up like an escarpment, known as Ammonite Hill, they found a second living plant. The party included a naturalist, but his scope was strictly limited!

Returning to Dalla (Ain means merely, "Well"), they picked up their reserve petrol and motored 125 miles to Ammonite Hill in a single day, another instance of the enormous advantages of a car on flat desert stretches. The real test had yet to come. To get to Owenat, where water was known to exist, the best way would have been to follow the Kufara track; but trouble had broken out at that place, the Italians were known to have dropped bombs on it, and white men would therefore probably receive anything but help from the tribesmen. However, it was soon found impracticable to go that way in any event.

At noon on 24th October, in intense heat and glare, they left Ammonite Hill, each car carrying 90 gallons of petrol and 16 gallons of water, or sufficient for ten days at least. This was a very great weight, which made it essential to avoid any unnecessary bumps if the axles were to survive. Along the Kufara track they found continuous dune crests 100 to 200 feet high, at intervals of about half a mile. At first they followed camel tracks through the gaps between these dunes, but when the ends of the dunes adjoined and the sand became more humpy it was impossible to continue. Repeated turns and twists to north and south produced no result. A sandstorm blew up; and whenever a car stuck it was almost impossible to get it out again, because the gale filled up the cavity as soon as the

men had scooped it out. They therefore edged away to the south, and at last came to the Twin Hills, a couple of small rocky points where the dunes tapered away into the dreary desert plain. Another attempt to get west soon brought them to more dunes, more soft sand, in which all three cars stuck. Ahead was higher country, reddish and brown hills and peaklets, behind which lay the mountain mass of Gilf Kebir. There was so much soft sand here that they turned south once more, following Prince Kemal al Din's route to Owenat, and leaving the Gilf for later exploration. It was fiercely hot, the sand radiating like the opened door of a furnace. The cars were bogged to their axles, and in this heat had to be dug out, turned round by main force, and driven back upon their own tracks for eight miles, before any further progress was possible. Camp this night was made lively by a host of small flies, while on the succeeding night a colony of jerboas, those curious little desert rodents, kept everyone awake by hopping over their faces. What these creatures lived upon was a mystery. Not far away, however, were the mysterious cliffs of the Gilf, rising like an enormous coastline, seamed with ravines and shadows, yet inaccessible; and here, somewhere, there was probably water and small life. It was still 150 miles to Owenat.

A few miles farther on they passed the marks of Dr. Ball's two Ford cars, still clear in places, although thirteen years old. They then picked up the tracks of Prince Kemal al Din's caterpillars; these had been made for five years, yet they were still clear

enough to carry the Bagnold party to Owenat; so little rain, so few travellers, such utter emptiness, is there in the Western Desert. For seventy miles, or nearly half the distance, the vertical cliffs of the Gilf rose on their right hand to a level top more than a thousand feet above them. When only seven miles from the Owenat spring they had the bad luck to break a gear-wheel; the car, with its petrol and stores, was abandoned. More serious was the extra load which the other two cars had to bear, but they got through undamaged.

Jebel Owenat (or Uweinat) is another table-topped mountain, rising straight out of the desert like an island from the rolling sea. It has been occupied on and off for many centuries; but no rain had fallen now for three years, the sheikh had gone away, and only seven miserable natives in rags remained. There were three water-holes, the first being encrusted with salt and almost dry; but the others contained excellent water, were surrounded by stunted date palms, with grass and acacia trees, and looked wonderful to eyes that for days had seen nothing but rock and sand. At various times during the last five thousand years—ever since the earliest Pharaohs reigned in Egypt—hunters and nomads had made drawings on the cliffs, crude but forceful and still quite clear at many points, of men, women, giraffes, hunting, dancing, and so forth; some of these were now photographed for future study.

Major Bagnold next went almost due east to Selima, which is not very far from the Nile at Wadi Halfa, thereby crossing some hundreds of miles of

quite unknown country. He was looking, of course, for the "lost oasis", but found no sign of it. The first fifty miles was over low sandstone hills, with boulder-strewn ground between. They did find an oasis with some growing grass, but there was no visible water, and they did not dare to stop long enough to explore it thoroughly. Then across gently waving sand, followed by giant crescent-shaped single dunes; a cold north wind was blowing up sand at the time, so that the golden summits of the dunes seemed to hang in the air, their bases being invisible. They camped between the points of one of these dunes, fully sheltered from the wind; the height was seventy feet, the distance across the crescent 220 yards. The dune advances by the wind driving sand over the top, when it slides down on the inner side and out towards the two horns; but the rate of movement of course is very slow. If one kicked at the bottom of the slope, or disturbed it with a shovel, it gave out a deep booming noise, and by increasing the speed of the blow one could raise the pitch to a shriek.

Fifty miles beyond this camp was a landmark, similar to many which have since been laid down by the Eighth Army farther north: a solitary empty petrol tin. It had been left by Major Jennings Bramly to mark the route to Selima, and similar tins were picked up at intervals for the next eighty miles. At Selima there is excellent water in unlimited supply, besides two small groves of date palms. From Selima there were two ways home; by the desert road, almost due north to Asyut, 450

miles, or forward to the Nile (150 miles), and down the Nile by water. They elected the former; but in order to obtain fresh supplies sent a car to Wadi Halfa, which made the journey in a single morning. What Mr. Bertram Thomas would have said of such desert travel is not recorded!

On the 8th they started for home, along a route that was clearly marked and much travelled. At one place, says Bagnold, they encountered the skeletons of camels "in tens of thousands". They "several times counted more than 200 in a single mile". Probably they were the accumulated wrecks of many a caravan struggling north across the desert to Kharga Oasis. For the cars it was easy, and easy, too, to get into Kharga, but not so easy to get out. Several of the Egyptian oases have at least one face which is a sheer cliff. Kharga is one, the northern face being so difficult that camels have frequently failed on it and have tumbled to their deaths below. By climbing the cliffs on foot, however, a cleverly concealed route was discovered, up which the cars made their way. The country at the top was rocky, being covered with spherical balls of limestone up to twelve inches in diameter; to negotiate these being impossible, they turned aside, only to get into a terrible country, where the whole surface was broken up, some lumps being as large as a house. They backed out of it again, and eventually reached Asyut on 14th November, and Cairo the next day. They had covered 3100 miles, of which 700 miles was through hitherto unknown sands. The Zerzura Oasis had not been found.

We have mentioned that there was trouble between the Italians and their nominal subjects at Kufara. Next year this gave rise to a terrible desert crossing, in which Major Bagnold's abandoned car played an honourable part. Having overcome the rebellion at Kufara in January, 1931, the Italians expelled the rebels; this was almost equivalent to inflicting a death sentence upon them. Others fled with their families and few belongings, of which the most precious were camels. Some went due east across the desert to Farafra Oasis in Egypt, others south-west to the French Soudan. Mr. P. A. Clayton, of the Egyptian Desert Survey, was at work in the west, when he found at Owenat some of the refugees from Kufara; they were proposing a march to Dakhla Oasis, which lies about midway to Cairo, in the very middle of the desert. He therefore retrieved the abandoned car, which he had the means of repairing, and sent ten of the feeblest Arabs, including three small children, in this car direct to Halfa. They were the most fortunate of all, however, for five hundred people had gone to Owenat, believing that there they would find both water and pasture; but it was still dry and deserted. The refugees then split up. About 100 to 150 went off through the heart of Africa to Merga, in the Sudan; the remaining 400 set off on an amazing march to Dakhla, north-east into the stony Egyptian desert. They included many women and children; some of the men were wounded; they did not keep together, but travelled in small, disorganized parties; and nobody actually knew the route. They therefore

followed the tracks of Kemal al Din, although these made various detours and considerably increased the distance. However full the water skins might have been at the start, they could not outlast this long journey. After twenty-one days, the leaders struck the track between Kharga and Dakhla, but about twenty-five miles too far to the east. Happily they realized their mistake and turned back. As soon as they reached the Oasis, the news of their plight was telegraphed to Cairo, and the government there commandeered all cars in both oases, and sent them out into the desert with food and water. A camel convoy followed. This errand of mercy succeeded, but many of the people were at their last gasp. They had been abandoning their belongings, they had no food, and in extreme cases were even drinking the nauseous camel's blood to quench their maddening thirst. Ultimately 300 got into Dakhla; the rest perished. The first to arrive, says Clayton, must have covered more than 420 miles without watering.

In 1931 the same Mr. Clayton was back at Owenat, whence he made a remarkable one-day run up the western side of the Gilf Kebir, mapping it for a long way. The plateau is 150 miles long, up to 50 miles wide, and half as large as Belgium; and it rises so sheer from the sands at most places that explorers were naturally intrigued to learn what lay within and upon it; but two things, the shortage of petrol and water, for a long time limited the search. The cliffs wound in and out into many dry wadis, in which deep shadows lay, their walls being anything up to 1500 feet high; one wadi, however,

was broad and flat, and ran far to the north, its surface marked by numerous trees. In 1933 and 1934, Mr. P. A. Clayton continued his work, until he had got the main outlines of the Gifl on a map; it then transpired that there were two plateaux, with a fairly wide gap between them. The southern one was fringed by cliffs almost everywhere, but the northern one dropped into the base of the great Sand Sea.

Meanwhile, a very adventurous survey of much of the Gifl had been carried out from the air. Sir Robert Clayton, a young naval officer, who had bought a Gipsy Moth plane and had obtained six months' leave, used them both in a flight over the Western Desert. He was accompanied by Count L. E. de Almasy, who had been working for the late Prince Kemal; and in addition, it was arranged that Mr. P. A. Clayton should lend ground support with three Ford cars. The aerial survey was somewhat of a risky business, since the owner reported his machine as having been mended, when he procured it, with string and gum! From the machine they found out the features which we have just mentioned, besides obtaining some fine photographs of the tree-studded wadi; and they also spotted a group of small extinct volcanoes, half buried in the sandy desert between the Gifl and Owenat. Sir Robert Clayton found it extremely difficult to judge his height above the sands, through the lack of any shadows or other obvious marks of relief. He necessarily flew low, in order to follow car tracks whenever possible; this was most trying to the eyes. Eventually they came

down to complete the work from the ground. A dump was made in the middle of the desert between Owenat and Halfa, on the Nile, a conspicuous dune being chosen. Sir Robert's party, in two cars, then made a trip to the cliffs of the Gilf, but on the way back the Arab who was driving the leading car tried to cut off a corner and so lost the trail. Squadron-leader Penderel and Sir Robert Clayton, who were in the second car, also missed the outward tracks. As soon as the driver's mistake was discovered they stopped, took bearings on some dunes, and then tried to discover a cairn which had been set up against some such contingency; but there was no sign of it. It was getting dark, the rising wind was whirling up sand, and those in the leading car had only a single four-gallon tin of petrol in reserve. If they could not find the dump, and quickly, their position would soon be most serious. They returned to the others and camped. Next morning the three Arabs in the party were sent out to scout, but they returned an hour or two later, saying that they could not recognize their surroundings. This meant possibly a walk through the desert on meagre rations for forty or fifty miles to a rendezvous where P. A. Clayton and Almasry would be certain to call; alternatively they could gamble on a ride to the north, in the faint hope of finding some known landmark before the fuel gave out. They decided on the latter course. This day having been lost, they slept thirsty and woke even more so. After some time, the Arabs were sent off again to a small hill fifteen or twenty kilometres distant, which looked as if it might bear

the cairn; but they returned at noon, saying that there was no cairn. This was not true; in fact, the Arabs had only gone a short distance, and had then decided without examination that the dune was bare. Matters now looked grave indeed. "I must say," wrote Clayton in his diary, "that I was a bigger coward than I thought I was. I was really frightened." Most people so situated, several hundred miles from any likely relief, would have been frightened too. However, the little party did not lose their heads. At 3 p.m. they went back sixteen kilometres in the car, so as to collect what water remained in the second car; then they set out north once more through the dunes. At first they found difficulty in making progress, then they came to a little sandhill where the last petrol was all used up. On climbing this hill, with the faint hope of spotting the beacon, there it was above them; actually, they had been within twenty-five miles of it all the time. From this beacon they knew the direction of their dump; and the Arabs, who were probably soundly rated for their negligence, were sent off on foot to bring back a tin of petrol for the car. Thereafter to get home was easy. We have mentioned this incident because it shows how the merest negligence or mischance in such an utter wilderness as the Western Desert may imperil the lives of an entire party.

Sir Robert Clayton did not long survive this adventure; but the work of exploring the Gifl was carried on by the others in subsequent years; and in 1938 Major Bagnold and a large, well-organized party even spent a month around its barren cliffs,

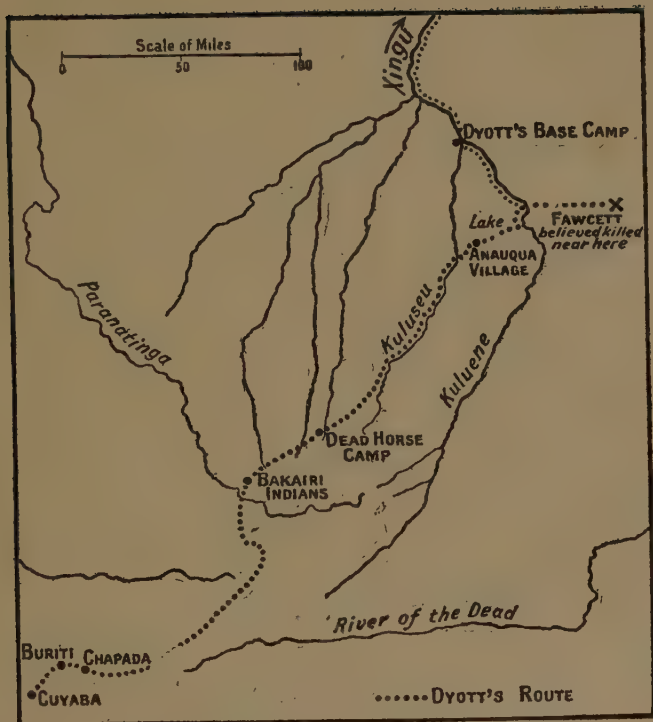
mapping, making measurements of the rate of sand dune motion, photographing the many rock drawings, and even climbing to the top of the Gilf and exploring its southern half. They found the summit a curious place—a practically bare, waterless plateau, from which a few small volcanic cones arose. Its sides dropped sheer to the desert or to the profound depths of some winding wadi; and owing to the flatness these drops were not apparent until one stood almost at the very edge, with the immense plain behind one and the abyss at one's feet. The Gilf would have made an ideal stronghold for a robber band, had it possessed any perennial water; but robbers, and everyone else, except the map-maker and the archæologist, keep clear of that part of the world; it is too dry and rough even for them.

CHAPTER XI

The Search for Colonel Fawcett

At the very moment when Dr. Hamilton Rice and his large party were nearing Manaos, after the successful ascent of the Uraricuera River recorded in Chapter V, another expedition, meagre in resources and small in numbers, was setting forth into the southern border of the vast Amazon basin, a party the fate of which has aroused much discussion ever since. It comprised Colonel P. H. Fawcett, his elder son Jack, and Mr. Raleigh Rimmell, a young





THE SEARCH FOR COLONEL FAWCETT

Englishman; they had baggage mules, but after the first few weeks no carriers at all. They crossed the headwaters of the Tocantins and the Xingu, two giant southern tributaries of the Amazon, and have never been heard of since.

The country of Matto Grosso, where the explorers vanished, is a wild region, abandoned by the Brazilians to numerous naked Indian tribes. It is high and dry and like a desert during six months of the year; but from it there arise not only these Amazon headwaters, but also those of the great Argentine river Paraguay and the almost as important Rio San Francisco of Brazil. Around these headwaters marshes gather. The gorges, and narrow strips along the streams themselves, are filled with forest. Up above rise table-topped mountains, like the Gifl Kebir, but smaller; and it was one of these which probably inspired Conan Doyle's story of the Lost World, which you may remember contained reptiles long believed to be extinct, but shown to be otherwise by the eminent Professor Challenger. Peopled yet unknown, vast yet without a single road north of Cuyaba, such a region was bound to be the scene of legends as wild and improbable as anything in fiction. Lights had been seen to twinkle in the cliffs; probably because flakes in the sandstone caught the sun, but ascribed to an active and suspicious race who would hold no communication with any other tribe. Light-coloured individuals had been seen there, probably lighter-skinned savages than usual; but they were reported to the credulous as descendants of some early white race which had

invaded South America many centuries ago. What was there in reality nobody knew. If one started thither with a caravan, the mules would be bled to death by bloodsucking vampire bats; and this is not a legend, but a reality. The travellers, even if they did not perish of hunger, would probably be overwhelmed by the natives and either killed outright or submitted to some lingering form of death. Fawcett himself, who was inclined to be sensational in some of his pronouncements, said that the natives had the unpleasant habit of carrying their victims threaded on a bamboo pole, hanging by the tendons of their arms and feet. Be that as it may, near the water mosquitoes and all the vast tribe of Amazonian disease-breeding flies and other biting insects, would soon induce fever in the unwary, if not death. All in all, there were good reasons for the Matto Grosso having been largely avoided by civilized man.

It was these very reasons which made Colonel Fawcett desire to go there. He had a vast experience of the great river and its inhabitants, and he was utterly fearless, besides being abnormally hardy. Previous expeditions had been so often ruined by the breakdown of hired local labour that Fawcett had long believed in the need for a small, all-white party; and in his notable mapping of the River Heath some years earlier he had carried out this plan successfully, taking only half a dozen British ex-soldiers. He also believed that by making friends with the Indians instead of fighting them, he was far more likely to get through their country

unhurt. For food, after his transport was exhausted he proposed to rely on what the country—that is to say, the Indians themselves—could provide. He was quite prepared to stay months, or even years, among these people, until he had learned all about them and about the truth or otherwise of the tales which were told of their land.

Accompanied, as we have said, by his son and young Rimmell, Colonel Fawcett left Cuyaba, a Government outpost near the source of the Paraguay, at the end of April, 1925, and by mid-May had reached Bakairi, the last outpost of civilization on the edge of the highland wilderness: a few miserable huts, surrounded with barbed wire as a precaution against the Indians, and not even possessing a water supply. From here he wrote a cheerful report to the Royal Geographical Society (which had provided him with valuable instruments) on 20th May; but it is known that Raleigh Rimmell had already injured his foot, although he was well on the road to recovery. From Bakairi the trio went on, with two native guides, to a place called Dead Horse Camp; it was so named because Fawcett had lost his horse there during an earlier attempt, in 1920. From this point he wrote his last letter, on 29th May. Ahead was the country of the Gayapos and other tribes, where the real adventure would begin. From Dead Horse Camp the two guides returned to Cuyaba; but one Bernadino, who had been taken on at Bakairi, went a considerable distance farther. When the explorers had been absent a year, their friends began to wonder what had happened to

them; when two years had elapsed, and no news whatever had trickled out of the wilderness, expeditions to ascertain their fate were talked of. Meanwhile, numerous rumours, mostly too stupid to be believed, had naturally spread around. It was said that Fawcett had taken up his residence among the savages and had refused to return to civilization. He had been seen on a roadside, watching mosquitoes devour his ankles; in a district which a subsequent searcher declared held no mosquitoes at all. And so on, *ad nauseam*, until after several years the Brazilian Government (which at first gladly assisted search parties, because Fawcett had done valuable boundary mapping for that State and was well known officially there) became heartily sick of the subject. Long before this stage was reached, however, what the present author believes to be the true solution of the "Fawcett mystery" had been found by Mr. G. M. Dyott, in 1928.

Unlike some of the would-be searchers after the missing men, Mr. Dyott had some valuable qualifications for his difficult task, since he had only recently been at work in a neighbouring region. On the other hand, the search was costly, and in order to finance it he had to depend upon newspaper support; for this reason, he was encumbered with much unnecessary baggage in the shape of wireless sets and cine-cameras. He arrived at Cuyaba almost three years to the day after Fawcett, with two wireless experts and two photographers. They made a rapid journey to Bakairi, with eight native helpers, called camaradas; and on leaving that unwhole-

some spot the caravan had swollen to sixty-four bullocks, ten mules and twenty-six men; for Dyott, unlike Fawcett, would make no attempt to live upon the country, but believed in having ample food supplies under his own control.

The first step was to follow Fawcett's trail to Dead Horse Camp. This proved easy enough, because the local Indians of Bakairi brought forward Bernadino, who had accompanied Fawcett for some distance. Bernadino engaged to accompany the party as far as he had been in 1925; he was quietly but persistently questioned, and in the end Dyott grew thoroughly to believe in him. Bernadino said that after leaving Dead Horse Camp the three white men had gone across country to the northeast. In that direction lie two large feeders of the Xingu, the Kuluseu first, and the Kuluene (which runs almost parallel to it) beyond. Fawcett had gone along the bank of the Kuluseu for some distance, when he secured a couple of native canoes; in these, piloted by Bernadino, he had gone downstream for a long way, to the village of the Anauqua tribe. Bernadino had then left him, and had taken back the canoes. All this sounded very simple, but to follow the missing men proved less easy. The streams were rapid, deep and not easily forded; in winter, to pass them would have been impossible without boats. When they came to the Kuluseu, and launched their canoes, they expected to reach the Anauqua settlement in six days, instead of which it took them twenty-seven. In its upper and narrower part, the river was full of submerged and half-

submerged trees, some so near the surface that the sharp branches would rip up the canvas although not a mark showed on the surface of the water; great trunks had fallen right across at other points, and could only be passed by hacking a way through with axes and knives. When the river widened, its water was sometimes so shallow that it ran over ridges of stone, and at other places boiled and surged like a mill-race. Many loads were lost through canoes overturning. To make the loss of food good, the party resorted to fishing, in which they were most successful. When at last Bernadino indicated that they had reached the Anauqua village, there was nothing to be seen; for like all such places, it lay inland, out of view from the river. One of the camarados, named Climaco, however, had gone on ahead and had opened up relations with the Anauquas. Meanwhile, on the seventeenth day of the river journey, Dyott picked up what appeared to be another sign of Fawcett, a Y-shaped cut on a tree.

The Anauquas proved to be friendly, but greedy. They lived in a small village behind trees and a swamp. The men went completely naked, each carrying a bow five or six feet long, with plenty of arrows. As their language was unknown, Dyott had to make himself understood by signs, but despite the difficulty of this, he got along well enough for his purpose. Leaving two white men in charge of the camp and the canoes, he, with the other two, went to the village, where the chief, a muscular but evil-looking Anauqua named Aloique, met him in the open space between the malocas. As the strangers arrived,

brown-skinned people poured out of the houses to see them; by distributing a few trinkets, a good impression was made, and the white men then went freely inside the malocas. Dyott caught sight of Aloique's wife, who was carrying a child which had round its neck a small oval brass plate, bearing the words, "W. S. Silver & Co., King William House, Eastcheap, London." This was similar to the name-plates on Fawcett's baggage. A few minutes later, he found in Aloique's home a small metal trunk from the East, of a kind only used by the English. He longed to question Aloique, whom he had already begun to distrust, but he decided to go warily, and talked first with another native, named Cabuzala. Cabuzala remembered the three white men. He himself, with Aloique, two women and apparently also two young men, had carried the travellers' stores one day's march towards the east. On it being suggested that he should take Dyott along the same route, he showed fear, indicating unmistakably that the Suyas, who lived in that direction, would assuredly knock everyone on the head with their clubs. This tallied with what Dyott already knew of that tribe.

Mr. Dyott then approached Aloique direct, who showed great reluctance to talk, saying that the Suyas were bad men. More presents were exchanged; then, to Dyott's dismay, almost all the Anauquas produced baskets of farinha (food of which he had no need), and expected valuable knives and axes in return. He therefore beat a retreat to his camp, where he had vainly hoped to get his goods dry, and

by sitting on the boxes all day was able to keep off the pilfering fingers of the savages. In the middle of the night, while the Anauquas slept, everything was packed up; next morning at earliest dawn the expedition softly floated away downstream. Dyott himself, with Climaco, remained behind, being bent on following the trail of Fawcett to the east. They returned to the village, and by some luck and a few more presents, induced Aloique, three Indians of a neighbouring tribe, the Kalapolos, who were going home that way, and another Anauqua, to take him to the Kuluene. He now returned again and again to the theme of the three lost travellers. Aloique, who contradicted himself several times, made it plain that he and his people had not gone very far with them, but he was not believed. Travelling partly through the waste on foot, and partly across a swampy tract in canoes, they arrived at the Kuluene. Here, said the Kalapolos (who were much more friendly than Aloique), Fawcett and the other two had crossed the river. One of them, who had had a bad leg, was limping; this was probably Rimmell. Dyott and the rest stayed at the Kalapolo village, where the chief told him that the three men had been killed. He said that the Anauquas were bad people. His men had followed the travellers into the bush. On four successive days they saw the smoke of their camp fires; on the fifth there was no smoke. A month later other Kalapolos, when following the same trail, had found it barred by black and yellow feathers hanging from a string, a sign not to pass beyond that point for fear of death. Under

pressure, Aloique (who at first had said that he only went one day's journey with the whites, admitted that he, too, had followed them, but he repeated that the Suyu Indians had killed Fawcett. At a later date, he admitted that he knew where the remains were, and he described such bones as were left; but nothing would induce him directly to visit the spot. Accordingly, Dyott continued his process of slow advance, by asking to be taken on to the Kuluene. It was a wide, smooth stream; and while they were afloat, Aloique asked if he would like to see which way the three white men went. Dyott nodded assent, they disembarked on the far bank, and went across open sandy ground to a tree, which was hacked with Y-cuts. Aloique made signs that Fawcett had slept at a hut here one night. They crossed a creek in two canoes, and pushed through more bush into the beginnings of a dense forest. Suddenly they stopped, and Aloique broke into a pantomime of what had occurred, repeating the word "Suyu!" excitedly. He made signs for Dyott to be seated. The latter obeyed, and he pretended to hand him food. Then the other Anauqua, whose name was Rapatzi, edged round behind Dyott. Aloique stood up, seized a stick from the ground, and creeping round behind him, with a motion of silence, then leaped in the air like a madman and yelled, "Suyas! Bung-bung-bung!" at the same time hitting himself three violent blows on the back of the neck with his hand; he then collapsed as if he himself had been killed. Rapatzi also went through the motion of clubbing someone from behind.

This, then, was the probable end of Colonel Fawcett. He had travelled five days beyond the river, when he was treacherously attacked while seated on the ground. Aloique ascribed the murder to the Suyas, but Mr. Dyott clearly suspected that he himself had had a hand in it, even if he was not the principal. Much though he would have liked to follow the trail farther, the Indians refused; his party needed attention downstream, and for the present he turned north in that direction, Aloique and the others going with him in their canoes. Some distance downstream they met four canoes of another tribe, the Wicurus. The Anauquas looked glum, but Dyott succeeded in getting into conversation with the new arrivals. They wanted presents, of which he had none; and Climaco by a suitable pantomime made them understand that plenty of knives and other treasures lay at the junction of the Kuluene with the Kuluseu, where the white man's camp lay. A little farther downstream, the river narrowed to thirty or forty yards; more Wicurus lined the banks on both sides, bow in hand, and all expecting presents. Again the pantomime was repeated. Fortunately, the newcomers had only a few canoes, and their chiefs were induced to follow the white man in these, keeping about 500 yards astern. Arrival at the camp produced no relief, for other Indians had already arrived, and their numbers increased hourly. The camp, however, had been well chosen, and was quite defensible; it was also protected by a rope barrier, beyond which the Indians were induced to stay.

Meanwhile, Aloique had disclosed the fact (which he had at first denied) that he knew the direction taken by Fawcett, and for a rifle and a shirt would take Dyott to the scene of the tragedy. One of Dyott's Indians overheard him later telling another Anauqua that he intended to kill Dyott in the same way as Fawcett had been killed; and this was hardly reassuring to the two camaradas who had been designed to accompany the party. Commander Dyott, whom Aloique had been urging to hurry back, then said that he would go to the spot, but would take his entire caravan with him. This seems to have frightened the savage, for next morning he and his fellows had vanished; nor were they seen again.

The commander did not dare to follow them, his hands being full of present trouble. One camarada on whom he had relied, Climaco, not liking the look of things, decided to go home and to take with him the only canoes (apart from the explorers' own canvas canoes) which were available. He went downstream to get more craft to replace his own, but he stopped, accepted presents of farinha from a tribe whom he encountered, and thus unwittingly brought more trouble on Dyott. The little camp at the confluence of the two rivers was now besieged by angry, greedy and disappointed savages. It was late afternoon. Dyott tried another pantomime, which—temporarily, at any rate—saved the situation. He pretended to be tired, and he then made signs that at sunrise next day he would give out presents before going down the river. He also indicated that the savages themselves should seek rest;

they did so, and this gave an opportunity for escape. At about midnight, when no object could be seen more than thirty yards from the bank, everything was loaded on board the canoes, in the strictest silence. They pushed off, slowly drifting downstream for some distance; and then, paddling as hard as they could, did not stop for fourteen hours, by which time they had put a very respectable gap between themselves and their pursuers. They were now on the Xingu itself, but still had a long way to go before reaching the first outpost of civilization; but although experiencing much trouble with rapids and hidden obstacles, and being forced to throw away most of their films, one of their wireless sets, and much other weighty stuff, they eventually reached the calm waters of the lower river. Dyott's canoe, which had led the expedition throughout, was patched in no fewer than eighty-four places in its 1000-mile journey over the rocks, through the rapids, and among the sunken trees.

Various other parties from time to time "sought" Colonel Fawcett, or at least went in the same direction; but nothing more definite was ever discovered about him. There is very little doubt that Commander Dyott had elicited the truth. One particular point in favour of his story is a detail which he himself did not elaborate, but which seems very significant to the present writer. At the end of July, 1925, shortly after Fawcett would have been killed according to Dyott's account, a dog belonging to the explorer found its way back to Cuyaba. Now it is most unlikely that a dog, which had become

attached to a man, and had followed him through the wilds for months, would have deserted him without good reason. One cannot help thinking that the reason was that his master was dead.

CHAPTER XII

North of Greenland

Within a few months of the remarkable adventures of Augustine Courtauld in the middle of the Greenland ice-cap a much more serious adventure befell a party of Continental scientists who had established a similar station much farther to the north, in the very centre of that frozen mass. The station, which was called "Eismitte", had been established at about the same time as the Cambridge station, by MM. Sorge and Georgi. Alfred Wegener, a distinguished Austrian geologist, and leader of the expedition, had intended relieving the station with the aid of motor sledges, but these failed. His anxiety about the fate of his companions led him to undertake a relief march, which simply resulted in the relief party as well being marooned at Eismitte. While trying to get out of this fix, Wegener and one companion perished on the march back to the west coast. We mention this mishap, not to point a moral, but merely to show how much during recent years Greenland has figured in the

minds of scientists and explorers. Apart from Wegener's expedition, which threw some light on the structure of the huge ice-cap, and from the many parties sent to both the east and west coasts by enthusiastic young men from Oxford and Cambridge, much work in mapping and exploring has been done by the owners of the country, the Danes, and it is about some of this that we are going to read now.

The Danes have a long and distinguished record of hard work in Greenland; and when we remember that Denmark is a very tiny country, and that its huge colony—eighteen hundred miles long and mostly seven or eight hundred miles wide—has many thousands of miles of coast, most difficult of access at all times, and possessing no great attractions at any time—this work is something of which the Danes may justly be proud. For the magnificent fjords, with their still water and myriads of bergs and berglets, the sheer cliffs, the ice-polished rocks, the strips of grass and patches of Arctic willow and low-growing shrubs, that make up habitable Greenland, lead everywhere to the frozen mass of the ice-cap, which can never be of any use to anyone. The needs of the world war forced the Allies to build a port, with wharves and all the appliances of modern transport (in Greenland so out of place), in order to help against the U-boat menace. Air stations were built, and landing grounds laid out, in places where the Eskimo strolled and the strong husky Greenland dog had his playground only a few years before. These airfields may have more permanence, but the

rest of Greenland will assuredly slip back into its centuries-old slumber, as the home of an attractive but primitive people, with a few hardy settlers and a few adventurers. All honour to the Danes, therefore, for what they have done to develop our knowledge of Greenland and its people.

Many years ago, after Nansen had made his memorable first crossing of the ice-cap, that frozen plateau was crossed again, this time by a Dane, J. P. Koch, and at one of its widest points. Another Dane, Mylius Erichsen, while seeking to explore the country that Peary had discovered in the extreme north, ran out of food, and in endeavouring to cross the ice-cap to a depot he and two companions perished of starvation. Yet another Dane, Einar Mikkelsen, who went a year or two afterwards to clear up the fate of Mylius Erichsen, was himself marooned, and spent two long and very harsh seasons in the grip of the ice before he was rescued on the east coast. A Dane of Greenland birth, Knud Rasmussen, won a world-wide reputation for his hardy exploits on and around the colony, as well as among the islands and fogs north of Canada. He built himself a home close to Cape York, in the north-west corner of Greenland, which he called Thule; and he knew more about the Eskimos than almost any other civilized man. Finally, a relative of J. P. Koch, Dr. Lauge Koch, a trained geologist, has spent much of the last twenty-five years in completing his country's map of the Greenland coasts, visiting the most unfrequented parts, and bringing back their rocks and fossils, so that scientists at home may learn more of

this country's singular geological past. It is with these two men, Knud Rasmussen and Lauge Koch, that we propose to deal now. Two expeditions are concerned; in the first, Rasmussen was leader and Koch was making his initial acquaintance with Greenland travel; in the second, Koch worked alone. On both occasions the object was to complete the mapping of northern Greenland's mountainous and ice-bound coast, so as to tie in the map with the known points north of Robeson Channel on the west and Independence Fjord (near which Erichsen had starved to death) on the east.

Rasmussen's party comprised himself, as leader, Dr. Lauge Koch, geologist, and Dr. Thorild Wulff, botanist, with four Eskimo hunters, their sledges and many dogs. Leaving Thule on 6th April, 1917, they went up the Arctic Highway, as it has well been called, through which the sea stretches between north-west Greenland and the high, sinuous Ellesmere Island on the west; a route well known through the efforts of three-quarters of a century, a route on which one might expect to find lingering the ghosts of those who had died there and the proud spirits of those who in this lonely part of the world had triumphed over Nature in her most savage mood. Here was Smith Sound, a wide expanse, nearly always choked with ice, and the common halting-place of most ships; on its western shore lay the base of the famous *Fram*, from which Sverdrup and his hardy Norwegians marched, mapped, and hunted over the length and breadth of Ellesmere Land. Here, beyond its narrow mouth, was the wide expanse of

Kane Basin, named for a stout-hearted American who, while searching for Sir John Franklin in the 'fifties, worked and suffered thus far north, saw his men die of disease, and narrowly escaped with his life. Here, beyond Kane Basin, lay the straight and narrow Kennedy Channel, its middle marked by a mass of whirling ice-floes, ever in motion as the strong current from the north drove them south; while on either side were the cliffs past which Peary had marched, and the frozen shelves on which he had lost eight toes. Here, next on the north to Kennedy Channel, was the still narrower Robeson Channel, where the only progress that a sledging party could make was along the ice-foot, an atrociously rough and often most dangerous shelf frozen fast to the rocks, with huge, barren cliffs on one side, and a sharp drop of many feet to the sea ice on the other. On the far corner of Robeson Channel was Fort Conger, a hut which Peary had built, looking north to the open Polar Ocean; this was the place to which he fought his way, by ship and on foot, so often, until in 1909, using it as a base, he gained his objective, the North Pole. That ships could be brought so far through such a sea seems incredible, that they could be got back safely to southern Greenland seems impossible; yet both feats had been achieved several times. Most notable was the British party in the *Alert*, who, under Sir George Nares, got right past the future Fort Conger to the edge of the Polar Ocean, and then sent sledge parties along the Greenland coast, where they reached a latitude of more than eighty-three degrees. The

principal sledge journey on this expedition was made by an extraordinarily determined young man, afterwards Admiral Sir Lewis Beaumont; his men went down with scurvy, but he hauled back the sick on the sledges, and although some of them died, and were buried at the mouth of Robeson Channel, his journey marked the limit of Arctic advance until Nansen went north in the *Fram*. It was these Englishmen whom Knud Rasmussen now proposed to follow, completing their map, and carrying it on to Peary Land, the northernmost peninsula of Greenland. Despite his full knowledge of the past history of the place, and his good organizing ability and great pluck, he and his party had a terrible time before the survivors struggled back to Thule.

At Etah, an Eskimo settlement which Peary had made famous, they were compelled to stay for some days by gales. Then they crossed the sea ice of Smith Sound, passed through Kane Basin, with the Humboldt Glacier (which they were to remember later) sprawling down from the ice-cap on their right, and they stopped for some time at Kennedy Channel, while the geologist collected a rich haul of fossils from the red, grey and black-banded cliffs above the icefoot. Queer things these fossils were, too, despite the weight which scarcely justified their carriage; for they included warm-water corals and shells, showing that ages ago this Greenland coast had worn a vastly different aspect. To get through Robeson Channel was not so easy, but they did it, still having abundance of dogs; and they came at

length to an old depot of Nares, where they found two hundredweight of Australian mutton in tins. Although it had been left there forty-two years before, it was still perfectly fresh, and you can imagine with what relish the hungry men attacked it. They also took from this depot about forty pounds of tallow, which was fed to the dogs; all animals have a craving for fat in cold climates. Food, in fact, was becoming a problem; for Rasmussen, like the Arctic explorer Stefansson, believed in living as much as possible upon the country, and had brought out supplies for two months only. He had six dog teams, totalling seventy animals, to feed, and was therefore justified in seizing anything that he could. The supply problem is the beginning and end of all such expeditions. Either you must take a ship, and from that ship send out parties to make depots, which you use up as you return from your farthest point; or you must rely upon finding musk-oxen, seals or bears upon which to live. Beyond Fort Conger, in the beautiful valleys which run into Grant Land, grass and flowers grow for a few brief weeks each summer; and in this remote spot great herds of musk-oxen were known to dwell, besides thousands of the monstrous white Arctic hares. It always happens, however, that when food is most needed it becomes strangely scarce; and so it was now. Seals, moreover, do not appear on the ice until the summer sun is out to tempt them to lie there.

At this part of the journey lies Hall Basin, named after an explorer who had died there. The British

had put up a copper plate to his memory more than forty years since. The Danes now visited the spot and found the plate intact, but its wooden support had been clawed by a bear. Not far away were the graves of two of Lewis Beaumont's poor sailors. One was tempted to go softly in those northern mists; one felt surrounded by the ghosts of the brave dead. But sentiment had to yield to necessity. Straight ahead lay the way, the Greenland shore, high and mountainous, running first north and then north-east, with many a deep inlet to break it. At first the Danes kept to the sea-ice; but they soon found, as Beaumont and Peary had done before them, that the way was barred by immense stretches of hummocky ice, higher than an average house, and the individual blocks of which were commonly larger than a room. It had been there for years. Pressure from the ocean landwards had forced the floes to crack, had driven the rear ones over those in front, shattering the edges, and had thus created what at first sight looked like a series of insurmountable barriers. But they had to be passed; and the Danes, with axe and shovel, hewed a way through each ridge in turn, before their dogs could pull the sledges forward; the mileage thus gained seemed negligible, but it *was* gained. Whenever they could, they made for the icefoot; but that, too, was very difficult to cross, for at many places sand and gravel were spread over it, so that the sledges would not run. From their backs came a bitter blast, as an icy gale poured down from the ice-cap farther south. Food was getting low. Finally, when they arrived at

Dragon Point, the nose of a promontory between Sherard Osborn Fjord and St. George Fjord, it was necessary to call a halt. This was the limit of Beaumont's advance. He had tried repeatedly to cross Sherard Osborn Fjord, which lay deeply buried in the softest snow, but was not strong enough to achieve his purpose. On Dragon Point he left a record, in a copper case. Rasmussen took it back, to be handed to the British Admiralty. For the Danes, however, this was far from the end; most of their mapping had yet to be done.

They began a search for food, but at first discovered neither musk-oxen nor bears, nor even a hare. Then, in a neighbouring fjord, two herds of musk-oxen were discovered, and twenty-six of the great beasts were shot for food. True to habit, each herd formed itself into a ring at the approach of danger, with their shaggy heads lowered and all facing outwards; and as one was struck the ring closed up, until all had been slain.

This fresh meat put new life into the Danes and their dogs. They succeeded in crossing the snow-drifts of Sherard Osborn Fjord, and went along the coast to the north and east, mapping the extensive fjords. At the very tip of Greenland is Peary Land, a lozenge-shaped mountainous mass, almost cut off from the mainland by several fjords on the west and by the large Independence Fjord on the east. Food was now again giving out, and dogs had to be killed. It was in this same region that Peary himself so narrowly escaped death by starvation at the beginning of the century. For Rasmussen to continue

round the coast would have been madness. He therefore ordered a return, but even so it was too late. To cut off the dreadful journey over the sea ice, they tried again and again to get up on to the Inland Ice; this is always a matter of great difficulty, the glaciers being steep and badly crevassed. At last they managed it, and then began a forced march, the leader keeping his weakening party well together. One of the four Eskimos went out hunting and was lost, Koch was far from well and Wulff obviously weakening. Gales on the ice-cap made matters worse; but the Danes succeeded in cutting off the great bend round Robeson and Kennedy Channels, passed round the back of Humboldt Glacier, and after some difficulty got down to the sea again in Kane Basin just below it.

They were still eighty miles from Etah, the nearest point at which relief of any kind could be found. Rasmussen, who realized that Wulff was now seriously ill, decided to go on himself for help, taking one Eskimo; Koch, Wulff, and the two other hunters were to follow slowly. The leader reached Etah on 25th August, at once organized a relief party, and soon afterwards his sledges were on the way back; but it was too late. When left at their camp, the three active men turned their thoughts once more to the possibility of finding game. The hunters ranged the snow and rocks, but in two days discovered only a single hare. Over everything, grey, damp fog brooded ominously. Koch, not liking the look of things, decided that at all costs an effort must be made to get on. They broke camp and

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crawled forward a mile or two; but Wulff, who could not continue, stopped, and again they camped. He could not digest solid food, but could take only a little broth, and was getting weaker every day. A further hunt produced practically nothing more, except the lean, unsatisfying hares. Day after day they struggled along the land edge in this way, until the poor botanist could go no farther. He called his companion to his side, announced his decision to stop where he was, and calmly dictated to Koch a report on the botanical results of the expedition. Then he bade the others go on, with the faint hope of obtaining relief. Reluctantly they did so, but when the relief came at last, he was dead.

Despite this severe test of Arctic travel, Dr. Lauge Koch returned to the very same region in 1920, with the intention of going right round the northern tip of Greenland, so as to complete his work there. On this occasion, he travelled alone, except for Eskimo hunters. In addition to dog teams they took two motor sledges. At the start, he had no fewer than nineteen Eskimo sledges, the aim being to release a few at successive stages on the long journey, but to retain three sledges and their dog teams as fresh as possible, with which he would carry on the journey beyond the point reached in 1917; and when that supply was exhausted, he would again attempt the risky business of "living off the country".

They started north up Smith Sound on 18th March, 1921. Much of the ice was smooth and

favourable this season, so that they made rapid progress to Robeson Channel, besides increasing the fossil collections. He then went across to Peary's old post, Fort Conger, where he stayed for a fortnight in one of the two huts. It was still early in April, with forty degrees or more of frost; but the midnight sun was shining, and by its light they tracked down plenty of game. When the journey was resumed, all the obstacles that had hindered the last journey were found to be as formidable as ever; nevertheless, it was still mid-April when he and his last three sledges stood once more at Dragon Point, watching the last of the supporting parties on its long march home. They crossed the fjord region once more, reached the northernmost point of Greenland on 13th May, and hoisted the Danish colours on a cairn there. From this spot, Koch with one Eskimo, travelling light, took a sledge straight out over the frozen ocean to $83^{\circ} 50' N.$, a trifle beyond the British best; the excuse was that from this more remote point they could see more accurately into the high mountains inland. Meanwhile, the two remaining Eskimos hunted along the desolate valleys; they caught rabbits, a wolf, and some birds, but no musk-oxen were found. As soon as the leader returned, they continued the march round Peary Land, until on 21st May Cape Bridgman was attained; this marked the northernmost point which the *Danmark's* people had reached, and by its inclusion in his map Dr. Koch completed his work: the Danish flag had now waved over every part of the Greenland coast. It is worth while sometimes to

open one's atlas and pick out these places, and to think about them for a moment. How much toil and suffering, wrecked hopes, disappointments and loss of life, lies behind those sinuous coastlines and the brief names of capes and peaks! Koch, Rasmussen, Mikkelsen reaped the final reward, but the labours of those who went before, and without whose faith and courage the thing would never have been completed, should not be forgotten. Dr. Koch himself, however, was in no enviable state of mind at this moment, despite his natural exhilaration at finishing his map. He had four people, including himself, to feed, no meat for his dogs; and his total resources comprised four small tins of pemmican and one bag of groats. It was a thousand miles to any depot. Necessity therefore ruled that a hunt for musk-oxen must now take precedence of everything else; but at this hour, as has happened so often before, fortune turned against him. A violent snow-storm came on, a blizzard which lasted for fourteen days without any real intermission. They dared not stop, except when forced to do so by sheer exhaustion; yet in the mist of whirling white flakes they could hardly see, and it was painful to face the icy wind, which bit into the frost sores on their lips and cheeks like the rubbing of salt into a wound. Each evening the weakest of the dogs were led a few yards away from the camp, shot, and then fed to the rest of the poor starving brutes. Their masters fared little better, all living on gruel, although to the Eskimos such diet was almost useless. By the time that the storm had blown itself out, half the

dogs were dead; then, taking advantage of a rare burst of sunshine, Koch sent one of the Eskimos out hunting. He went up a valley towards the mountains, and soon was seen to be signalling excitedly. Koch thereupon seized his rifle and followed the Eskimo inland. The native's keen eyes had spotted a number of moving black dots, but at a great distance; undoubtedly they were musk-oxen. The hunters hurried along, only to find their quarry hidden by a snow squall; but to rediscover the herd was now a matter of life and death. Approaching against the wind, so as not to give the wary beasts any chance to escape, they crept up the valley, but saw nothing, and, in fact, thirty anxious hours elapsed before they ran the herd to earth. It numbered nine big animals, all of which they killed. The entrails fed the sixteen remaining dogs to repletion; the men revived on beef steak and nourishing hot broth.

Dr. Koch now decided that, as it was still only mid-June, and there was every chance of picking up seals as they lay basking in the midsummer sun, further exploration ought to be carried out. The details of Independence Fjord, in particular, were very imperfectly known. Peary had believed that it, or another frozen seaway connecting with it, stretched right across north Greenland, so as to convert Peary Land into an island; but his channel had never been seen since. To test this statement, Koch took his little party into the fjord, heading west, along the barren, gravel-strewn plains of southern Peary Land, the very region in which Mylius

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Erichsen had worn out his strength fourteen years before. They found a cairn, erected by that unlucky explorer, which had never been visited since; and they took away his report, which was as well preserved as if it had been written only the day before. They rediscovered Peary Channel, proving that there was no waterway through.

It was now time to make for home. The easiest course being across the inland ice, repeated attempts were made to get up on to it, but at first quite unsuccessfully. Day after day they marched through sludge and water, until both dogs and Eskimos developed a kind of paralysis through long immersion in the ice-cold fluid; but Koch himself seemed to be immune. At last they got to the foot of the Academy Glacier, which led by a frightfully difficult and crack-riven route up to the ice-cap. Twice the leader fell into crevasses, hanging there by his arms alone until the Eskimos could pull him out again; the drop to the bottom seemed endless and was certainly hundreds of feet. One final hunt for food before making this ascent yielded only a few hares; all the musk-oxen had gone. One day they caught a couple of young fox cubs; they were pretty little things, which soon became domesticated and sat on the men's shoulders during meals, snatching bites. These cubs themselves became meals in the end, but not before one of them had rendered the party a great service, by running on ahead and so inducing the exhausted dogs to chase it.

The position was steadily becoming worse. Although they started the journey across the ice-cap

with sufficient food for 200 miles, that was far less than the distance to be covered, and the food must be eked out by slaughtering the dogs. The petrol, upon which the supply of nourishing hot food depended, had now almost gone, and to conserve what remained the four men simply thawed out the frozen hares and ate them raw; but there still remained a few cigars, with which a man will console himself against many evils. The march across the ice-cap need not be described; it was the usual do-or-die effort, no stopping more than necessary being either desirable or permitted; but the whole party had now become so weak from the lack of proper food, that one after another fell down, dizzy or even unconscious, which necessitated a halt while the sick man was revived. Then a final misfortune befell them. At Cape Heiberg Jorgensen, which is very far removed indeed from any settlements, it had been arranged that some of the Eskimos who had turned back earlier should return and establish a depot, so that the last party could get home alive. This had not been done; and Koch and his three followers were in precisely the same plight as Franklin had been just a century earlier, when the starving seamen dragged themselves to their "depot" hut in the Canadian Barren Lands, only to find it deserted and empty. Dr. Koch, however, was not the man to get panicky in a crisis. He took stock of the position. There remained a single sledge, with ten dogs so worn out that they were incapable of pulling it. He therefore tied a pole across the sledge and the men pulled it themselves, the dogs following as

best they could; and in such circumstances, no matter how far behind the poor brutes might stray, they always managed to struggle into camp in the end. It was still 200 miles to safety, and dog-food must be the staple supply throughout. When they had covered much of the distance, but were still sixty miles from a camp, four dogs alone remained, and this was the critical moment. Whatever happened, they must cover fifteen miles each day or perish. As the little party trudged along, the dogs trailed farther and ever farther behind; one collapsed, died, and they had to carry it into their camp for food. "Next day," says Koch, "we were all taken ill, and it needed the greatest will power to drag ourselves along." Probably they had been poisoned by the toxic effect of the starved animal, a thing which has happened many times in the past; they were lucky to escape so easily. Ill though they were, they still had to march, for to have yielded to the almost overwhelming desire to lie down and rest would have meant that they would never get up again. When thirty miles from safety, two dogs still remained. The ice-cap now had almost been crossed, "land"—that is to say; the mountains which fringe the ice-cap and prevent it from rolling *en masse* down to the sea—could be seen far ahead; yet it was not a pleasant sight, because storm clouds were gathering there, and any delay would have spelt certain death to all. Next day the gale broke, almost without warning. Providentially the wind came from behind them. They stopped the sledge, stuck a pole upright, fixed their tent upon it to serve as a sail, and getting

on behind were whirled madly down the glacier ice to the sea. Several times they crossed frozen lakes, the surface of which cracked beneath them, but as the water spurted up, the impetus of the sledge carried it on beyond the danger. How many crevasses were passed in like fashion will never be known. Thus within the space of a few hours, and when literally at the end of their tether, these determined men got down to their depot and were saved. The depot for which they had been making contained an abundance of food. You can imagine with what relish the tins were opened and the stove made to splutter and burn once more, and how delicious the smell of the steaming pot seemed to those hungry souls! The tents went up again, and there they stayed three whole weeks (largely held fast by bad weather). It was still three hundred miles to Koch's base on the west coast, but all serious danger was now over. In mid-September they finally left this spot, passing "the very place where in 1917 I had had to leave Dr. Wulff behind me". On 2nd October they reached Dr. Koch's house, having been away for exactly two hundred days, one of the longest sledge journeys ever made. On New Year's Eve he was back at the settlement of Upernivik, there to report the success of his task. But far away in the north, the ice still crushes and grinds itself to fragments against the iron-bound Greenland shore; the mists still cling maddeningly whenever the air is still, and the snow whirls just as maddeningly when the wind begins to roar. Up there the musk-oxen are breeding again, and the hares are hopping gaily

about; nor is there anything to disturb them except some canine prowler or a desperately hungry polar bear. It is better so; these are the natural denizens of such a place, not Man their alleged master.

